

MOTOR AGE

Volume XXXIX
Number 18

PUBLISHED WEEKLY AT THE MALLERS BUILDING
CHICAGO, MAY 5, 1921

Thirty-five Cents a Copy
Three Dollars a Year

11 Years of Prosperity Prove Hudson's Stability

*Don't You Want Security Like That
in Your Dealership?*

TODAY one thought stands ahead of every other consideration guiding motor car dealers in the choice of a line.

That is permanency.

Just how dealers are concerned by that question is clearly indicated by the number who are seeking to connect with those stable and experienced manufacturers, whose product and organization have emerged from every stringency in the industry with increased prestige and strength.

No one deceives himself that there will be a great overflow demand for second choice cars to prosper on as in the past.

And it is natural, now that buyers are in a position to discriminate, that dealers also must discriminate to survive.

The Hudson Super-Six has been a leader in fine car sales every year since its introduction. That has

meant success for Hudson dealers. Their sales rooms in every community reflect their prosperity.

But more, it has meant permanency. Ninety-seven per cent of the Hudson product is handled today through men whose connection with the organization exceeds seven years. In that time how many companies have been formed, put forth their product for a time, and passed out of existence?

Doesn't the present situation counsel the utmost care in connecting with a line that you know is securely founded?

Remember, that a Hudson franchise does not mean merely a successful business. It means also permanency in that business. Perhaps that may be its greatest worth to you.

There may be an opening in your territory. Write today.

Hudson Motor Car Company



Detroit, Michigan

(H-15)

**"With the
Pistol Grip and
Trigger Switch"**



*The exceptionally powerful motors
used in these Portable Electric Drills
mean a vast saving in time and money*



BLACK & DECKER

**Portable Electric Drills
Electric Valve Grinders**

Used wherever electricity is available. Operate on standard electric light circuits or farm lighting circuits.

In ordering, merely specify whether 110, 220 or 32 volt machine is desired. It makes no difference whether current is direct or alternating. They run on either.

Sold by the leading Machinery, Mill Supply, Electrical, Hardware and Automotive Supply Houses.

Upon request we will gladly send you complete catalogue describing our line of Portable Electric Drills, Electric Valve Grinders and Electric Air Compressors.

THE BLACK & DECKER MFG. CO.

General Offices and Plant
EAST PENNSYLVANIA AVENUE

TOWSON HEIGHTS, BALTIMORE, MD., U.S.A.

Boston,
609 Massachusetts Ave.

New York,
341 Broadway

Philadelphia,
318 N. 4th St.

Atlanta,
314 Chamber of
Commerce Bldg.

San Francisco,
910 Hayes Bldg.

Los Angeles,
210 Harrison Bldg.

Seattle,
201 Maynard Bldg.

Chicago,
1410 S. Michigan Ave.

Cleveland,
6125 Carnegie Ave.

Detroit,
9 Golden Ave.

Buffalo,
176 Hamilton Ave.

MOTOR AGE

Published Every Thursday by

THE CLASS JOURNAL COMPANY

MALLERS BUILDING
59 East Madison Street, CHICAGOHORACE M. SWETLAND, Pres. W. I. RALPH, Vice-Pres.
E. M. COREY, Treas. A. B. SWETLAND, Gen. Mgr.

Member Audit Bureau of Circulations; Member Assoc. Business Papers, Inc.

Vol XXXIX.

May 5, 1921

No. 18

CONTENTS

Do We Realize How Big Service Is?	7
The Service Parts Plan	8
Service Records of a Motor Club That Contain Some Valuable Hints	11
Practical Tire Merchandising and Repairing—Article I	12
Establishing a Flat Rate System	14
An Analysis of the Farmer's Truck Needs Based on Actual Experience—Article IV	16
Institutional Advertising Will Help	19
Taxes Before Commerce Body	21
News of the Industry	22 to 31

DEPARTMENTS

How the Electric System Works—IV	32
Better Business	34
Automotive Architecture	36
The Readers' Clearing House	38
The Accessory Show Case	44
Service Equipment	45
The Automotive Repair Shop	47
Weekly Wiring Chart	48
Passenger Car Serial Numbers	49
Specifications of Passenger Cars, Trucks and Tractors	50 to 53
Coming Motor Events	54

MOTOR AGE

MALLERS BUILDING
CHICAGOPhone Randolph 6960
Cable Address "Motage"

E. E. HAIGHT, Manager

DAVID BEECROFT, Directing Editor

RAY W. SHERMAN, Executive Editor B. M. IKERT, Editor

BRANCH OFFICES

DETROIT, 317 Fort St., W., Phone Maine 1351; CLEVELAND, 536-540 Guardian Bldg., Main 6432; NEW YORK CITY, U. P. C. Bldg., 239 W. 39th St., Phone Bryant 8760; PHILADELPHIA, Widener Bldg., Phone Locust 5189; BOSTON, 185 Devonshire St. Phone 4336 Ft. Hill.

SUBSCRIPTION RATES

United States, Mexico and U. S. Possessions	\$ 3.00 per year
Canada	5.00 per year
All Other Countries in Postal Union	6.00 per year
Single Copies	35 cents

Make Checks Payable to Motor Age

Entered as second-class matter, September 19, 1899, at the Post Office, Chicago, Illinois, under Act of March 3, 1879.

Owned by UNITED PUBLISHERS CORPORATION, 239 W. 39th St., New York, H. M. Swetland, Pres.; Charles S. Phillips, Vice-Pres.; A. C. Pearson, Treas.; Fritz J. Frank, Sec.

Outerall

REG. U.S. PATENT OFFICE
"The Economy Garment"

Mechanics Prefer the Outerall

The popularity of the Outerall one-piece garment is due to exclusive features of comfort and convenience, such as extra yardage in sleeve and back to make it roomy. Six Outerall factories are kept busy filling demand and the volume of production enables values that are unequalled. The nearest branch will gladly send samples.

MICHIGAN MOTOR GARMENT CO.
GREENVILLE, MICHIGAN

BRANCHES:

New York	377 Broadway
Chicago	1016 Medinah Bldg.
Kansas City	319 W. Ninth St.
Milwaukee	606 Mayer Bldg.
Indianapolis	466 Massachusetts Ave.
Des Moines	607 Observatory Bldg.
Springfield, Mass.	147 Dwight St.

Velie

Means More Profit to You

Because: No matter what type or size of car your customers desire — open or closed — from the small 2-passenger roadster to the big 7-passenger touring — you have it in the Velie line. Eight splendid models, all cord equipped — a car for every need or preference — Touring Cars — Sedans — Coupes — Roadsters and Speedsters. Two sizes of chassis, both six-cylinder of course.

Because: In the smaller Velie you offer your customers a six-cylinder car at the price of a four. Everybody knows the added power — the greater economy — the velvety smoothness of six cylinders as compared with four. Velie Model 34 completely equipped even to cord tires is the 1921 wonder of quality at low price. And on performance, the gold medal winner of two continents. Think of the market it gives you!

Because: If your customers want a larger six with all the power, all the room and utmost luxury — qualities they expect in cars costing \$2500 or more — you have the advantage of offering them Velie Model 48 at *many hundreds less*. With its great engine; with internally heated vaporizer burning low-grade fuel; with Timken

axles front and rear; Timken bearings all around; with the finest construction in every detail.

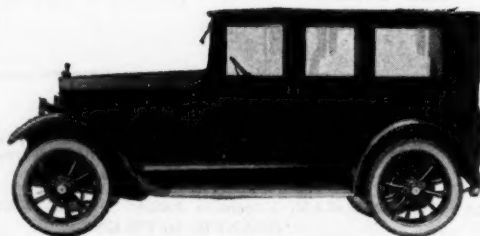
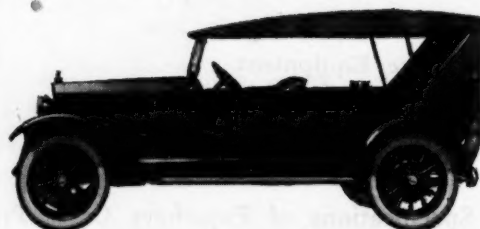
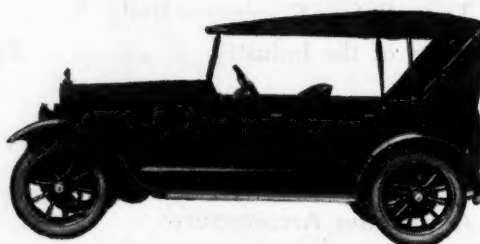
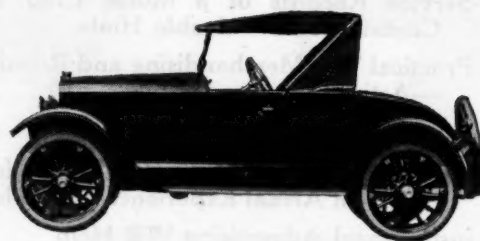
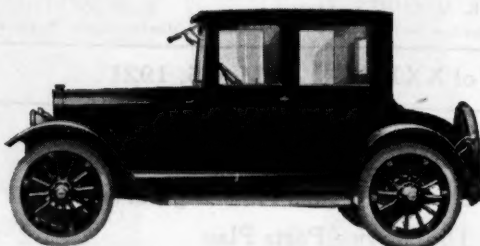
Because: Velie Sixes have exceptional selling points in their records for economy of fuel, tires and upkeep. *Get the facts.* Velie cars built ten years ago are still in faithful service. The reasons are found in Velie engineering — A mile of Velie factory — and the Velie's cardinal principle of using only such proved units as insure enduring cars.

Because: In style and beauty the Velie is admittedly a leader. The distinctive and envied pattern for long, sweeping, graceful lines. The Velie lasting mirror finish looks bright and new after years of use — deep, restful, upholstery, genuine leather and curled hair in open models; the richest fabrics in the closed. Compare Velie with the highest-priced cars.

Because: You and your Velie customers have the satisfaction and security of a product backed by one of America's largest and most successful manufacturing institutions. In these days of rapidly changing conditions Velie stability and sound financial position make the Velie franchise doubly desirable.

FINALLY: The Velie is backed by national advertising all the year 'round, and by liberal co-operation with our dealers. If your territory is not closed we suggest that you get in touch with us at once.

VELIE MOTORS CORPORATION, 113 Velie Pl., Moline, Ill.



MOTOR AGE



Do We All Realize What a Really Wonderful and Large Person This Man Service Is?

A PRIME factor, generally overlooked, is that service as an institution has grown to such gigantic proportions that it is entirely beyond the conception of the man who thinks in terms of a few years ago. It has grown to the point where no man, no system, no propaganda can control it. Service will be served. It exists in its magnitude and much of today's discussion is but the bursting of the swaddling clothes with which too many of us yet seek to clothe it. The independent repairman, who too generally gets no trade recognition, has become a factor with which the industry must reckon.

Not all repairmen, as some assert, are "gymps." They should have adequate discounts on parts. They should be made an ally in service instead of an enemy. What we all need is a better conception of things as they are in order that we may better determine how things ought to be.

The Service Parts Plan

*A Discussion of the Recently Proposed Plan for Service
With Comment on the So-called "Pirate," and With
Suggestions as to the Possible Outcome*

—By Ray W. Sherman

LATELY there has been going on within the industry and trade a rather spirited discussion on the subject of service parts and how they should be handled. Briefly, the argument started when someone suggested that some of the parts makers should get together in an endeavor to start depots in various cities and thereby make possible certain and fixed service on parts to car and truck users and dealers.

This discussion, if it has brought no other result, has certainly enabled the industry to take a good look at certain phases of itself. It has brought into the light of publicity, ideas, grievances and embryo plans of varied nature, and after it is all over, whatever the result, there should be at least a more healthful condition within the industry as a whole.

The announced reasons for putting forward this proposal were that service as handled today by the trade is of such a poor character that it is detrimental to the

welfare of the various products manufactured in the industry and is making it possible for certain manufacturers of parts to get into the field and sell their products for replacing the parts originally put into the vehicles.

Let it be said at the beginning that the terms "outlaw" and "pirate," as used in this story, do not carry with them any odium but are simply a repetition of the terms that have been frequently used in these discussions.

In the minds of some of those who have taken part in the discussion, an outlaw or pirate is any manufacturer who makes a part that is intended to replace a part put into a vehicle when it was originally manufactured or assembled.

In the minds of other people an outlaw or pirate is one who makes an INFERIOR part of this kind and palms it off as being equal in quality to the original part.

THERE are those who hold that the man who makes a replacement part on which he is willing to place his name, and back of whose quality he is willing to stand, is entirely reputable and should not be classed as an outlaw or pirate.

For example: The X..... Z..... Co. makes pistons for certain purposes. Is this company a pirate? It makes a good piston. It stands back of it. It guarantees its quality. There are many others in the same class, all making good parts and holding to high business ideals. The name "pirate" or "outlaw" should never be used in cases such as these.

These are phases of the discussion: It is contended that the establishment of parts depots to which dealers and truck owners could go to purchase original replacement parts would retain for the "original" parts maker some of the business which he today is losing to the so-called "outlaw," who in this story will hereafter be referred to as a REPLACEMENT PARTS MAKER.

It is admitted by practically everyone who is familiar with the business that in some cases the prices that have been charged for service parts have been too high. Too great a margin of profit has in some cases been added in the progress of the parts from the original maker to the assembler, to the distributor, to the dealer, to the consumer. One argument in favor of the parts depot plan is that it would cut down the amount of

The Industry Has Grown

ONE thing that must not be overlooked in this discussion of the parts service is that service has grown to such gigantic dimensions that it is entirely beyond the conception of anyone who thinks of the industry in terms of a few years ago. It is so large that no one man, no system, and no propaganda can control it. Much of today's discussion is but the bursting of the swaddling clothes with which too many of us seek to clothe the service situation. All of us need a better conception of things as they are in order that we may better determine how they ought to be.

work necessary for handling the parts and would thereby insure lower prices and in this way combat the maker of "replacement parts." In some cases list prices are fair and the abuse is attributed to overcharging.

It is also claimed by some parts people, and admitted by some of the vehicle manufacturers, that service is a load the vehicle manufacturer would be glad to get rid of and turn over to the parts depot, and that it would also relieve the dealer of the financial burden that a parts stock entails. Also, under the present system there is bound to be some

duplication of stocks if different cars handled by different dealers use the same parts—which duplication the parts depot would eliminate.

While the establishment of these parts depots would deprive the manufacturers and dealers of some of the present profit on service, it is claimed that the resulting efficiency would considerably overshadow the lost profit.

On the other hand, there is a strong array of opposition to the proposed plan and in all the meetings that have thus far been held on the subject nothing at all like agreement has been reached. The vehicle maker claims that he has for years fought the battle and should not at this date be deprived of the profits which are necessary for him if he is to continue to handle service.

He claims that service and parts cannot be separated because they are so closely united in their relationship.

He claims that service should follow the vehicle from the time of its manufacture to the day it goes out of use, wherever the vehicle may be.

It is claimed that it is unfair for the parts maker to enter into competition with the assembler of the vehicle—and the parts maker claims his only object is to help the assembler.

One manufacturer states the parts makers have all they can do to make parts without extending their activities into this other field.

The parts profit, while in some cases

it may have been too high and possibly should be revised, is, it is held, necessary in order to carry the service overhead.

Any proposal of the parts maker for extending credit to car makers, distributors and dealers on parts sold through these depots would set up a system that, it is asserted, would be so elaborate it could not be handled and would only serve to increase the price of parts.

One car manufacturer, who makes most of his own parts, states that it has been his ideal for some time to work out a system whereby his dealers would supply 95 per cent of the service parts orders within 24 hours and that during November, December and January, 97 per cent of the service orders on cars were supplied within 24 hours and 92 per cent of the service orders on trucks—and this by the dealers from their own stocks.

The parts business is also, says one, a guide to the engineer who has the designing of the vehicle. The service parts system is in reality one of his laboratories.

The parts distributor, states another, as proposed under the new system, would be just as inefficient as anything that exists under the present system and no material benefit would result.

The parts profit is valuable to the manufacturer, distributor and dealer and is necessary if they are to continue to make and sell vehicles of present quality at present prices. It has helped carry many of them over the recent crisis.

The buyer of a vehicle looks to the dealer for service and it would be disturbing and detrimental to the entire industry were he required to look to any other person for his service.

The reputation of the vehicle maker could not be maintained if the handling of repair parts for his vehicle were taken out of his hands.

THE PROFITS ON PARTS AN IMPORTANT FACTOR

The profit on parts helps to pay the overhead of the dealer and this source of revenue should not be taken from him.

The foregoing are some of the reasons for the plan and the reasons against it as gathered in a broad investigation, and it has been difficult during the weeks of this discussion to determine what the probable outcome might be. There are a few observations and reflections, however, which seem to be at least partly correct and they are here set forth for the consideration of those who may be interested in the subject.

In the first place, is it not correct to assume that service should follow the vehicle no matter where the vehicle may go? In other words, if the manufacturer is to produce a product should he let it pass out of the merchandising system which exists today and let it shift for itself?

The industry has spent a number of

years developing a merchandising system which today is far nearer perfect than it was ten or twenty years ago. Is it not reasonable to assume that the best way to arrive at better service is to continue to improve the system which we have created rather than to set up any

The "Pirate"

IN the minds of some of those who have taken part in the discussion, an outlaw or pirate is any manufacturer who makes a part that is intended to replace a part put into a vehicle when it was originally manufactured or assembled.

In the minds of other people an outlaw or pirate is one who makes an INFERIOR part of this kind and palms it off as being equal in quality to the original part.

There are those who hold that the man who makes a replacement part on which he is willing to place his name, and back of whose quality he is willing to stand, is entirely reputable and should not be classed as an outlaw or pirate.

new system for taking care of the ills and the needs which we now experience?

If poor service on the part of the factory and dealer is a condition which we desire to remedy is it not better to conduct an educational campaign for educating the factory and the dealer to proper service rather than to introduce a new system which might only complicate things and in the end might be more costly than even the system which we today have?

A man who is intimately familiar with the subject says that service is the rock on which this industry will either build itself or wreck itself within the next few years. The subject obviously is one which requires a great deal of serious consideration. Is it not logical to believe that we shall do better if we first make an effort to improve the existing system rather than create a new one?

Anyone familiar with automotive products at least partly agrees with the assertion that parts and the service connected with them cannot well be separated. The man who purchases a vehicle buys it from a dealer and, so far as he is concerned, the dealer is the only one with whom he has any connection. He looks to this dealer for service and if satisfactory service is not given he will not purchase that make of vehicle when he is again in the market. Service and sales belong together. Rendering proper service is to the advantage of the factory and the dealer and the success of both these factors in the industry depends to a great extent upon the character of service which they give. All of them are today cognizant of the importance of service, and for a long time the

entire industry has been giving serious attention to the problem. If this serious attention is increased and if further efforts are made to improve service shall we not eventually arrive at an improved plan which will give all of the results that are desired by those who have proposed the new and different system of handling parts?

So far as the so-called "pirate," or "outlaw," or "independent" parts maker is concerned, he will always be part of the industry and no plan which can be devised will put him out of business. In some cases the parts which are made by "replacement parts makers" are better than the original parts themselves, and in that case, the independent manufacturer surely has a legitimate place in the scheme of things and should be encouraged rather than discouraged.

The only probable outcome for the so-called "pirate" situation is for the maker of reputable parts, no matter for what use they may be intended, to place his name upon them, to trade-mark them, to place quality in them and thereafter to stand back of them and market them at a reasonable price. It might not be amiss to suggest that perhaps the real "pirate" in the parts business is the man who makes a part on which he is not willing to place his name. If a man is willing to place his name upon a part, and to stake his reputation on the quality of the part, he must at least be given credit for endeavoring to maintain a standard.

CORRECTING UNETHICAL PRACTICE BY MUTUAL UNDERSTANDING

Aside from that there are certain ethics that must be reflected in the business and it might perhaps be suggested that every parts maker consider the fairness of his practices. If he intends to go into the business of manufacturing original parts for vehicles, should he not respect the rights of others who are doing the same thing and should he not ethically refrain from endeavoring to secure the service business on parts made by his coworkers and competitors? There are certain bad conditions in all kinds of business which can be corrected by nothing other than a better understanding between the competitors in those lines and the education of them to a point where they see the folly of what in some cases might be termed unfair competition.

There was a time in the old days when a certain car that "went over the hill on high" used to "lay for its competitors" demonstrators at the foot of a certain hill and then rush the hill in high, carrying a banner: "We are going up in high. What gear are you in?" It was within the law but it was not ethical. Today it "isn't being done." It is hard to define ethics in business but it is nevertheless a specific thing. Anybody can campaign for and secure some of the replacement business on another man's original part but the question is too varied in its aspects for full discussion.

The "independent," or so-called "pi-

rate," or "outlaw" parts or "replacement" maker will always be part of the industry and no system which can be set up will do away with him. In some cases he is rendering a distinct service and it is not possible to divide the entire industry into groups of black and white sheep. It is too difficult a problem.

The factory must take seriously in hand the problem of making good on its service. One factory, realizing that its dealers for a variety of reasons had not been giving anywhere near 100 per cent service, established a system of about 25 service branches of its own in which it keeps a stock of parts. These it supplies to dealers, reserving to itself a small discount subtracted from the ordinary

discount given to the dealer on parts. This small discount enables the factory to show a profit on its system of parts depots and insures a prompt and adequate service to the users of its vehicles throughout the United States. The system, so far as a casual observer can determine, seems to bring about all of the results which would be secured by the proposed system of parts depots.

Another manufacturer has established a service department in which he has practically eliminated complaints from service delays and in which he handles in an efficient manner 13,000 separate parts and during the course of the year makes a very satisfactory profit on them, at the same time passing them on to the

users of his vehicles at a reasonable price—giving consumer satisfaction and factory-dealer profit.

The dealer also must go diligently into this question of service. He is already doing so and if given a little more time will make some progress which will be very gratifying to those who are today giving so much attention to the subject.

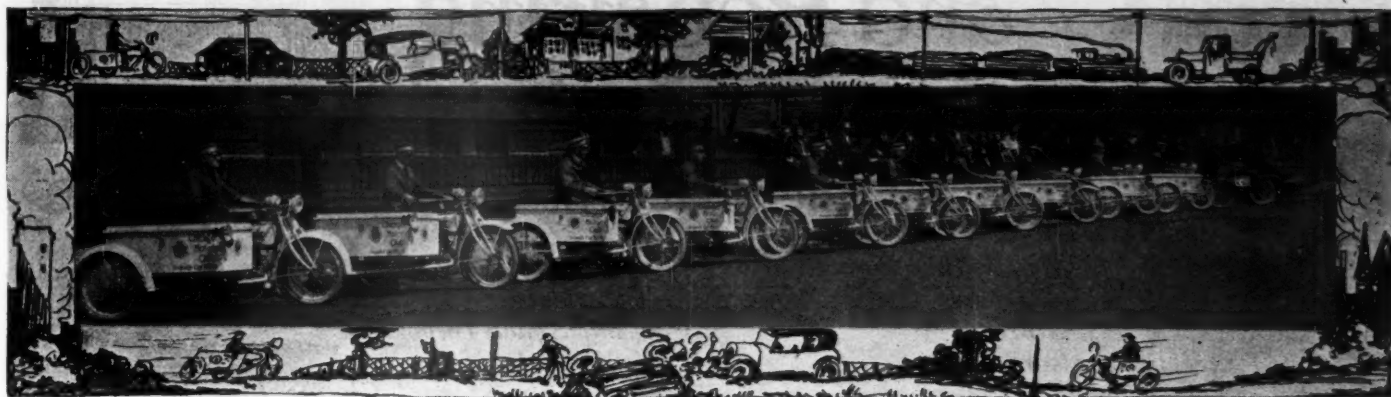
The system which we have today has so many good points connected with it, and the industry has spent so many years working it out and developing it, that it would seem wise to give further consideration to the problem of improving the present system before endeavoring to correct its faults by discarding it and setting up a new one.

The Points Brought Forth in This Discussion of the Subject Are Here Set Down for the Consideration of Those Who Are Interested

What Do You Think?—Send in Your Opinion

- 1—Service must follow the car.
- 2—Service parts and service labor cannot well be separated.
- 3—The maker of replacement parts of even the most inferior kind will always be part of the industry.
- 4—The manufacturer of any part who wishes to retain as large as possible a volume of business must make a fight for it by trade-marking his parts and establishing their quality. In that way he can hope to retain a large volume of what he states he is today losing.
- 5—The factory must make a very serious effort to develop its own facilities to a highly satisfactory degree.
- 6—The dealer must improve his service to such a point that the good name of the vehicle itself will not suffer and his customers will not be compelled to seek elsewhere for service parts in order to get proper service on the cars and trucks they have bought.
- 7—We have a system today which has many wonderful points of merit and we should give adequate consideration to our existing system before we decide to discard it and set up a new one.
- 8—If the desire for too great profit on the part of the parts maker, vehicle assembler or dealer enters into this controversy an effort should be made to arrive at the lowest possible retail price for parts that is consistent with economic business operation and the list prices should be given publicity.
- 9—It has been suggested that a seldom mentioned consideration is that the assembler, after he becomes established, gets volume and makes money, often begins to make his own parts and that the parts maker believes his only future lies in an industry of small local assemblers, which consideration, if it exists, opens the way for wide speculation concerning industrial fundamentals.
- 10—The discussion has done good, even though it terminate with no further action. The varied and widely different views on the subject, as disclosed by a comprehensive investigation indicate that:
 - a—It will be difficult within any reasonable time to determine on any parts depot plan that will bring anything like general satisfaction.
 - b—In isolated cases assemblers have worked perfections of the existing system that seem to give all the results aimed at in the new plan, indicating that a perfecting of the existing system may be a possible way of securing the desired result of better service. This, furthermore, is something on which work can be begun at once, whereas the proposed plan seems difficult of accomplishment because of the variety of opinion.
 - c—Many movements start several times before they are successful. They are discussed, dropped and discussed many times. Is it not probable that this movement, if it is an industrial need, would be helped if further discussion were postponed until each interested person can reflect upon it without that pressure that has been occasioned by the subject's abrupt introduction into industrial affairs.
 - d—Some of the alleged "poor service" is attributed to the use of parts, made for service, in the assembly of vehicles because of the shortage of parts and the desire of assemblers to get production. With the passing of this shortage will not much of the cause for the alleged poor service be eliminated?
 - e—A prime factor, generally overlooked, is that service as an institution has grown to such gigantic proportions that it is entirely beyond the conception of the man who thinks in terms of a few years ago. It has grown to the point where no man, no system, no propaganda can control it. Service will be served. It exists in its magnitude and much of today's discussion is but the bursting of the swaddling clothes with which too many of us yet seek to clothe it. The independent repairman, who too generally gets no trade recognition, has become a factor with which the industry must reckon. Not all repairmen, as some assert, are "gymps." They should have adequate discounts on parts. They should be made an ally in service instead of an enemy. What we all need is a better conception of things as they are in order that we may better determine how things ought to be.
 - f—We are today going through a rather trying period, and the entire effort of the industry should be concentrated on getting back to a basis of stability where we shall all function consistently before we resort to expedients of a too revolutionary nature. The industry needs all its energy and effort to bring itself back to a basis of successful operation. Should we not concentrate on this rather than on any problem which may work more of anxiety than of benefit?

Emergency Service for Stranded Owners by a Motor Club from Which the Dealer May Glean Some Valuable Hints



The fleet of motorcycle trouble shooters that answers calls from owners having difficulty with their cars or smash-ups

THERE is much in the service rendered by the Chicago Motor Club to its members from which the automotive dealer's service station can take a few lessons. In the first place the mechanical service of the club has been properly organized and therefore functions as nearly a 100 per cent as it is physically possible to. Up until a few months ago that club used five trucks equipped for towing, etc., but these have been discarded in favor of ten motorcycles and side cars. The plan of action is something like this.

When a call comes in to the club from a stranded member the dispatcher sends out one of the motorcycles the driver of which is a first class trouble shooter. If he can handle the job and make the necessary repairs or adjustments on the spot the car owner proceeds and the dispatcher comes back to the club or to the service station in that particular ward. If towing is necessary the dispatcher notifies the nearest service station which has been authorized by the club and the car is towed by the truck from the service station.

One of the stipulations of the service rendered is that the car must be towed to the service station from which the truck operates, but it is not necessary to have the repairs made at the particular institution. In most cases, however, if the men in charge of the service station are good salesmen they sell the car owner on having the repairs made in their place of business.

The ten motorcycles operate only in Cook county, which has been divided into 73 zones, according to the amount of travel, etc. In each one of these zones has been placed a service station selected after investigation as to the facilities for handling, towing and doing good work at standard prices. The service station must have a good tow car equipped with chain hoist and maintain 24 hour service. The car must keep in its own zone and go to the members' aid only upon call from the dispatcher.

The motorcycle dispatchers are stationed over the county where they can get to a disabled car readily. Generally

they are at the mechanical service station. Only a few of the motorcycles are out in the morning, none at 2 p. m. and all from 5 to 10 p. m. after which the force is cut down. Some are on the job all night, however. Sundays and holidays all the machines are out on patrol duty. Only calls are obeyed that come from the club itself.

The members must telephone the club from which the messages are relayed to the dispatchers. Record is kept of every instance where service is rendered and a compilation of these calls is here published. These figures readily show that electrical troubles are far ahead of any other excepting wrecks. To the

automotive dealer or service station these figures mean much as they immediately give him an accurate analysis of motor vehicle operation as a whole. These figures may be instrumental in having a dealer tool up for certain classes of field service. These figures cover a period from August 20 to March 2, 1921.

The motorcycle and side car attachments are white and the box contains tire tools, three gallons of gasoline, two freshly charged batteries, having two leads to reach the disabled cars' starting motor, one gallon of oil, a Pull-me-out, funnels, assortment of wrenches, hammers, screwdrivers, pump, reel light, etc. On the inside of the cover of the box is a blueprint of the zone in which the motorcycle is operating. The motorcycles are equipped with Carbin radium dial speedometers, spotlights, etc.

At the club house the man in charge of the service has a map before him upon which is shown the location of every dispatch rider by a numbered button. In this way the chief dispatcher knows at all times just where his squad is operating. The men in the field notify him when they change their location and he moves the button accordingly. A record sheet shows the time of arrival and departure of each driver every time he moves. The dispatcher himself has a sheet on which he records the name of the member, address, make of car, where stalled, nature of trouble, time of day, etc.

The chief dispatcher is responsible to the director of service, Charles P. Root, under whose supervision the motorcycle and side car equipment was installed. The motorcycle service was put in operation April 21 and replaced four trucks and four runabouts. The thought in replacing the trucks was that the motorcycles could get around much quicker in the territory and be of vastly more assistance because the nature of the trouble generally is such that the trouble shooter can meet it satisfactorily and have the driver on his way again. The upkeep expense of the motorcycles also is less than that of the trucks.

Service Statistics

	No.	Per cent.
Wrecks (broken wheels, springs, steering gears, smashups)	2198	26.83
Ignition	2110	25.82
Cold engines	1110	13.58
Battery	774	9.46
Carburetor	430	5.25
Frozen engines, radiators, etc.	356	4.35
Starter	343	4.18
Gasoline line	334	4.08
Clutch (under wrecks) ..	201	2.46
Out of gasoline	145	1.77
Vacuum tank	132	1.61
Engine bearings	102	1.25
Stuck in mud	100	.81
Brakes	44	.053
Tire trouble	42	.051
Hot engines	41	.050
Timer	15	.018
Oil pumps	3	.003
Total	8180	

The above is an analysis of 8180 calls for service by members of the Chicago Motor club. The dealer should be able to draw some conclusions from the above table as to just what equipment he needs to service stranded cars by noting which class averages the highest



Practical Tire Merchandising and Repairing

by Stanley P. McMinn



Locating the Place of Business

*Main Traveled Highway Best Location
Pick Shady Side of Street
How to Choose a Store
Level Street Necessary
Hills to be Avoided*

*"Automobile Row" Always to be Preferred
Most Efficient Size
Parking Space Important
Cleanliness Is Necessary
How "Chain Stores" Choose Locations*

THERE are few things of greater importance to the tire merchant and the tire repairman, particularly the former, than a proper location for his place of business. If the business is one in which tires are both sold and repaired it undoubtedly will be desirable to locate on one of the main traveled streets of the city.

If the business is confined almost exclusively to tire repairing and tire service, it probably would be better to locate on a side street not far removed from one of the main arteries of travel. It is wisest to choose a location which can be easily seen by passing motorists and where sidewalk signs (Fig. 1) or perhaps an electric sign (Fig. 2) can be used to the greatest possible advantage.

AUTOMOBILES INTEREST EVERYONE

The automobile owner's interest never seems to lag. Even those who have owned and operated cars for years like to stop and look in at the windows of automobile and accessory salesrooms.

This is one of the excellent reasons for locating the tire store on "automobile row" if possible as such a location gives prestige to the business. It is good advertising. It immediately takes the business out of the "gyp" class and places it on a plane with other high-class merchandise organizations.

INVESTIGATE POSSIBLE LOCATIONS

Before locating anywhere it is well to investigate possible locations very thoroughly with a view to finding out just where motorists are most apt to pass, or, what is more important, to stop.

In this connection one might take a leaf out of the book of any of the successful chain store merchants, as for example, the Woolworth 5 and 10 cent stores, Riker-Hegeman Drug Stores, United Cigar Stores, or the United Retail Candy Stores, the latter being the largest, and perhaps the most successful, big chain of stores to be started.

Before such a store is opened, trained investigators of the company spend weeks and even months examining possible locations. Passersby are closely counted and tabulated. A sample report taken from the files of a chain store

Read All of Them

The subjects which will be treated thoroughly in this series of articles on Practical Tire Merchandising and Repair are listed below.

- 1—Locating the Place of Business.
- 2—Makes of Tires to Handle
- 3—Handling the Sales Force.
- 4—Letters and Post-Cards.
- 5—Advertising.
- 6—Window Displays.
- 7—Salesroom and Office.
- 8—Service Station Facilities.
- 9—The Service Station.
- 10—The Service Car and Its Equipment.
- 11—The Repair Department.
- 12—Equipping a Shop.
- 13—Tube Repairing.
- 14—Fabric Tire Repair.

organization would tell exactly the number of men, women and children passing a given point at any hour of the day or night. It would tell how many of the men were smokers and how many were not.

WHAT INVESTIGATIONS SHOW

These investigations are instituted because it is of the greatest importance to the proprietors of the stores to know beforehand approximately how many customers they can reasonably expect. Such investigations invariably show that while anyone of four main corners apparently might prove to be as suitable as any of the others, one stands out predominantly as the best. That is the location that is chosen.

The same principle can be applied to the location of the tire salesroom. Patient investigation will bring approximately as big returns here as in the case of any of the big "chains."

NEVER LOCATE ON A HILL

For example, experienced garagemen will never establish a garage on a hill or at the foot or the top of a hill. They have learned that car owners will not stop at any of these places.

The same applies to a tire salesroom. Choose a street that is level; otherwise

there will be constant trouble with cars rolling off jacks. Car owners will shun a location that appears dangerous.

In making preliminary investigations be sure to get on the best side of the street. Pedestrians, who are potential car owners, and therefore, eventually possible customers for your merchandise, may prefer one side of the street to the other. In some cases there may be a reason for the bulk of the travel on a particular side of the street.

One side may have better pavement; one side may have more attractive store fronts. All of these things have a bearing. Obviously, the tire salesroom should be on the side of the street that attracts the most trade.

CHOOSE THE SHADY SIDE

Climate and the geographical location of the city may have an important bearing on the street chosen. In a number of cities in the south, business is virtually suspended on the sunny side of the street in the afternoons. The shady side gets all the traffic and all the trade. In the morning the sun is not strong enough to be uncomfortable, so that merchants who get the afternoon sun have stores that are virtually only 50 per cent efficient because people will not walk in the hot sun.

If your business is already established, if you have a location, do not take the foregoing too much to heart. In other words, do not be carried away by the thought that poor business may be due to a poor location.

Do not go to the expense of moving until you have exhausted every effort to increase business at your present location, and are thoroughly satisfied that nothing but another location will turn the trick.

CHOOSING A STORE

Choosing a store is of no less importance than choosing a location. In addition to housing your business, do not forget that your store will be your home and the home of your employees for at least 8 hours out of every day, and perhaps more.

For this reason it should be comfortable and attractive. It should be well

lighted and well ventilated and the heating arrangements should be such that it is easily possible to maintain a temperature of at least 65 Fahr. even on the coldest days in winter, this temperature being the one under which work is performed most efficiently. These and many other points should be studied before definitely making your choice.

GOOD VENTILATION NECESSARY

For example, the height of the ceilings is of much more importance than the average individual imagines. Low ceilings invariably mean poor ventilation.

High ceilings may not mean good ventilation but at least they mean better ventilation.

The odors given off by a tire stock and particularly by tire repair materials, either new or in process of being cured, may be offensive to office workers. Much of this trouble can be eliminated by proper ventilation.

BEST CEILING HEIGHT

The size of the business will also have a greater or lesser effect on the height of the ceilings. As a case in point, a 7 ft. 6 in. or 8 ft. ceiling would very nicely accommodate a 2-tier tire rack without waste of space. On the other hand, a 3-tier rack will require a ceiling 10 ft. 6 in. or 11 ft. high which is about the maximum necessary height both for ventilation and for proper display and handling of the stock.

Of two stores, one having few windows and one having many, choose the one with many windows. Windows mean light for you and your workers and consequently better work; but what is of greater importance they mean display space.

CORNER STORES ARE BEST

A corner location (Fig. 3) is always far superior to one in the middle of a block (Fig. 4). In the first place the corner is more prominent, provides better window space and allows an attractive entrance. In the second place it automatically provides two streets where customers may stop and where minor service work can be done.

The actual size of the store, or rather the floor space in a store, will be dictated to a very large extent by the size of the business. It has been found that dimensions of approximately 18 by 50 ft. are ample for the ordinary retail tire



A Lesson on Selecting a Front

Fig. 3, upper left—A corner location is always far superior to one in the middle of a block. Fig. 4—Upper right—A store located in the middle of a block does not attract the attention that one on a corner gets. Fig. 5, Lower left—Although the most efficient size of tire salesroom is about 18 by 50 ft. this dealer has nearly 100 ft. frontage but a very shallow store. The steps are undesirable because they make it difficult for customers to get tires in and out. Fig. 6, Lower right—If possible, choose a store where advertising signs can be used to the greatest advantage

business coupled with a moderate size repairshop for handling passenger car tires exclusively.

Where greater space is required it is desirable, if possible, to increase the length rather than the width. The 18 ft. width comes very close to being the most effective width for the disposition of stock, showcases and possibly the location of a desk. A store with floor space 18 by 100 ft. is a large store and will accommodate a very complete tire and accessory stock and leave plenty of room for a fully equipped repairshop (Fig. 5).

GET ROOM TO GROW

In general, it must be remembered that in life we must progress—we must

grow. We cannot stand still and exist. It is necessary to expand. Therefore, it should be the object to get a store perhaps a little too big at first rather than one that is a tight fit for the business.

AVOID NARROW STREETS

In the first instance we have room to grow and expand and in the second case, if our business has been run properly, we must move very soon into larger quarters. It may be several months before the expense of moving and the loss of sales due to the unfamiliarity of our trade with the new location compensates for what we have gained by the increase in space.

Be very sure to choose a store where

(Concluded on page 28)



Fig. 1, Left—It is best to choose a location that can be easily seen by passing motorists. Fig. 2, Right—Electric signs such as this one cost little to operate and their advertising value is great

Establishing a Fixed Price System

In This Article Are Outlined the First Steps Necessary to Compile the Time and Cost for the Separate Service Operations

By Roy E. Berg

IN OUR study of fixed price and maximum estimate service systems we have seen how service operations under these plans reduce to practically a minimum, the dissatisfaction of customers. We have also seen how the service departments of various companies have been placed on a paying basis through the use of a flat rate or maximum estimate plan.

There are certain things that must be considered and certain arrangements made by any dealer who wishes to install a flat rate or maximum estimate service plan, and these are:

- 1—It is preferable that the dealer handle but one make of car or at least that his volume of business be done on but one make and it is more convenient when this make of car is a standardized product, or composed of standardized component parts.
- 2—By the use of the MOTOR AGE Master Sheet, work out a uniform rate of charges for each operation as listed on the Master Sheet.
- 3—If the Master Sheet does not conform in its entirety to the particular type and make of car handled, the changes should be inserted and each new operation given its proper code number.
- 4—Reorganize the service department and create a service sales department because this is where the advantage of the flat rate service system is most readily apparent.

The above considerations are in fact

the nucleus of the whole system. It is fairly well understood by everyone that a flat rate system is really an efficient system based on production and the history of all production plants is that, the greater the output the lower will be the unit cost. Therefore, those dealers handling but one make of car or at least attaining fairly large volume on one make and not devoting their energies between several makes and many models can well afford to consider the fixed price system in a better light than their neighbors.

MASTER CHART NEEDED

The most difficult task before the dealer who is about to install the fixed price service system is the working out of the uniform classification of repairs, their time allowances and charges. To do this MOTOR AGE has worked out the Master Chart with a decimal numbering system for each repair operation. This chart is a great aid to anyone endeavoring to outline and organize the service department under flat rate operation. It will probably take three or four months of good intensive work for any dealer to work these time limits and charges out but the effort will be well repaid. It is our feeling in the matter now that any amount of work, if it brings in a profit, is worth while, and certainly satisfied customers of the service department, making that much abused department pay a profit, are worth while.

Start out first by taking one of the most common service operations, let us say tuning the engine. It is general to

include in engine tuning, an adjustment of the valve tappets, an adjustment of the carburetor, and if necessary a tightening of any loose bolts on the engine or within the bonnet that are causing a rattle. If this interpretation of the "tune engine" operation is correct, then these operations for a period of three months should be carefully checked and time allowances kept by accurate means.

It very often is possible to facilitate matters a good deal in this respect by looking back over six month's records to see just what the cost of these items to the owner have been. Let us say that these records reveal a variation in prices of from \$3.50 to \$5, and that thirty-five records are found. The cost of all these operations is added up to a grand total and this total divided by thirty-five. Thus is obtained a general average which can be charged for every "tune engine" operation. It is also well to find out what the average time is for this operation and establish the time limit as a bogey limit. A very good check on the men is obtained through this means as it enables one to find out which men can come within the time limit and which cannot.

Every operation on the car should be listed in the same way. It may be that the operations as listed on our Master Sheet will not entirely agree with the necessary operations or that there are not enough operations listed, for the particular car that is handled by every dealer. The insertions may be very conveniently made, however, for the system as presented here is laid out on a decimal system. (Explanation of the Decimal System on page 46.)

Master Sheet of Service Operations

Every Basic Operation Is Classified and Detailed in Keyed Groups in the Following Chart

1. GENERAL LUBRICATION, Etc.

- 101. Change oil in crankcase.
- 1011. Oil and grease complete.
- 1012. Oil and grease complete, including springs.
- 102. Fill oil and grease cups.
- 103. Replace oil and grease cups.

2. ENGINE.

20. MINOR ADJUSTMENTS.

- 201. Tune up engine.
- 2011. Install new spark plugs, tune up engine.
- 2012. Clean carbon.

21. COMBINATION OPERATIONS.

- 211. Clean carbon, tune up.
- 2111. Grind valves, tune up.
- 2112. Clean carbon, grind valves, tune up.
- 212. Clean engine.
- 2121. Clean and paint engine.
- 213. Adjust main and connecting rod bearings.
- 2131. Scrape and adjust main and connecting rod bearings.
- 2132. Install and scrape new main and connecting rod bearings.
- 214. Overhaul engine, serviceable.
- 2141. Overhaul engine, excellent.

22. VALVES AND VALVE GEAR.

- 221. Install new intake valves.
- 2212. Install new exhaust valves.
- 222. Install new valve springs.
- 223. Adjust push rods.
- 2231. Install new push rods.
- 2232. Install new push rods and guides.
- 2233. Check valve timing.
- 224. Install new timing gears.
- 225. Install new camshaft bearings.

23. CYL'DERS, PISTONS, BEAR'GS.

- 231. Install new cylinders.
- 2312. Install and regrind cylinders.

- 2313. Tighten cylinder base nuts.
- 2314. Install cylinder base gasket.
- 2315. Repair intake manifold.
- 23151. Install new intake manifold.
- 2316. Repair exhaust manifold.
- 23161. Install new exhaust manifold.
- 232. Install new piston pins.
- 2321. Install new piston pin bushings.
- 2322. Install new piston pins and bushings.
- 233. Install and lap in new pistons.
- 2331. Fit new rings.
- 234. Adjust connecting rod bearings.
- 2341. Scrape and adjust connecting rod bearings.
- 2342. Adjust main bearings.
- 2343. Scrape and adjust main bearings.
- 235. Repair upper half crankcase.
- 2351. Install new upper half crankcase.
- 2352. Repair lower half crankcase.
- 2353. Install new lower half crankcase.
- 236. Tighten motor leg bolts.
- 2361. Install new motor leg bolts.

24. COOLING SYSTEM.

- 241. Install new radiator.
- 2411. Install new radiator core.
- 2412. Repair radiator, bad repair (1 1/4 core).
- 2413. Repair radiator, slight repair.
- 242. Install new radiator hose, upper.
- 2421. Install new radiator hose, lower.
- 243. Overhaul water pump.
- 2431. Repack water pump.
- 2432. Install new water pump shaft.
- 244. Install new fan assembly.
- 2441. Install new fan shaft bearings.
- 24412. Adjust fan shaft bearings.
- 2442. Install new fan belt.
- 24421. Tighten fan belt.

25. GASOLINE SYSTEM.

- 251. Install new carbureter.
- 2512. Overhaul carbureter.
- 2513. Clean and adjust carbureter.
- 252. Install new gasoline line (long).
- 2521. Clean gasoline line and strainers (long).
- 2522. Repair gasoline line (long).
- 253. Install new gasoline tank.
- 2531. Clean gasoline tank.
- 2532. Repair gasoline tank.
- 2533. Repair gasoline tank gage.
- 254. Install vacuum tank.
- 2541. Overhaul vacuum tank.
- 2542. Clean vacuum tank.
- 255. Install new gasoline line (short).
- 2551. Clean gasoline (short).
- 2552. Repair gasoline line (short).

26. LUBRICATION SYSTEM.

- 261. Overhaul oil pump.
- 2612. Clean oil pump.
- 262. Install new oil gage.
- 2621. Repair oil gage line.

27. MUFFLER.

- 271. Install new muffler.
- 272. Repair muffler.
- 273. Clean muffler.

3. CLUTCH DISK.**30. COMBINATION WORK.**

- 301. Overhaul clutch.

31. PLATES.

- 31. Install new clutch plates or disks.

32. BEARINGS.

- 32. Install new throw out bearing.
- 322. Install new pilot bearing.

33. CLUTCH, PEDAL, BRAKE, ETC.

- 33. Adjust clutch.
- 331. Adjust clutch pedal.
- 332. Adjust clutch brake.
- 333. Install new clutch spring.
- 334. Install new clutch shifter dogs.
- 335. Install new clutch main plate.

34. SHAFT AND CASING.

- 34. Install new clutch casing.
- 341. Rebush clutch shaft.

CLUTCH (CONE)**35. COMBINATION WORK.**

- 351. Overhaul clutch.

36. LINING.

- 361. Install new clutch lining.
- 3612. Soften clutch lining.

37. BEARINGS.

- 371. Install new throw out bearings.
- 3712. Install new pilot bearings.

38. CLUTCH, PEDAL, BRAKE, ETC.

- 381. Adjust clutch.
- 3812. Adjust clutch pedal.
- 3813. Adjust clutch brake.
- 382. Install new clutch springs.
- 383. Install new throw out yoke.
- 384. Install new clutch drum.

39. SHAFT AND CASING.

- 391. Install new clutch casing.
- 392. Rebush clutch shaft.

4. GEARSET.**40. COMBINATION WORK.**

- 401. Overhaul gearset.
- 402. Renew oil gearset.

41. GEARS.

- 41. Install new 1 and 2 speed gear.
- 412. Install new direct drive gear.
- 413. Install new reverse idler gear.

42. BEARINGS.

- 421. Install new bearings.

43. CONTROL LEVERS.

- 431. Remove rattle from control levers.

44. CASE.

- 441. Install new gearset case.
- 442. Repair gearset case.

5. PROPELLER SHAFT.**50. UNIVERSAL JOINTS.**

- 501. Overhaul front universal.
- 5011. Rebush front universal.
- 5012. Install new front yoke.
- 502. Overhaul rear universal.
- 5021. Rebush rear universal.
- 5022. Install new rear yoke.
- 503. Rebush both universal.
- 504. Repack both universal.
- 505. Install new dust cover.

51. DRIVE SHAFT.

- 51. Straighten drive shaft.
- 511. Install new drive shaft.

6. CHASSIS.**60. FRAME, FENDERS AND TIRE CARRIER.**

- 601. Straighten front fender.
- 6012. Install new front fender.
- 602. Straighten rear fender.
- 6022. Install new rear fender.
- 603. Overhaul tire carrier.
- 6032. Straighten tire carrier.
- 6033. Tighten tire carrier.
- 604. Straighten one front frame extension.
- 6042. Straighten one side rail, front.
- 6043. Straighten one side rail, center.
- 6044. Straighten one side rail, rear.

61. SPRINGS.

- 611. Repair front spring.
- 6111. Install new front spring.
- 6112. Reset front spring.
- 612. Repair rear spring.
- 6121. Install new rear spring.
- 6122. Reset rear spring.
- 613. Tighten all spring clips.
- 6131. Install one new spring clip, front.
- 6132. Install one new spring clip, rear.
- 614. Install new shackle bolts and bushings, front.
- 6141. Install new shackle bolts and bushings, rear.
- 6142. Install new shackle bolts and bushings, front or rear.
- 6143. Tighten all shackle bolts.

62. REAR AXLE

- 631. Repair front wheel.
- 622. Straighten rear axle shaft.
- 6221. Install new rear axle shaft.
- 623. Adjust pinion shaft (end play).
- 6231. Adjust differential carrier (side play).
- 624. Overhaul differential.
- 6241. Install new differential bearings (2).
- 6242. Install new drive gear and pinion.

63. WHEELS.

- 631. Repair front wheel.
- 6312. True up front wheel.
- 6313. Install new front wheel.
- 632. Line up front wheels.
- 633. Adjust front wheel bearings.
- 634. Repair rear wheel.
- 6343. Install new rear wheel.
- 635. Install new hub cap.

64. BRAKES.

- 641. Overhaul foot brakes.
- 6412. Reline foot brakes.
- 6413. Adjust and equalize foot brakes.
- 6414. Free up foot brakes.
- 6415. Remove rattle, foot brakes.
- 642. Overhaul emergency brakes.
- 6423. Adjust and equalize emergency brakes.
- 6424. Free up emergency brakes.
- 6425. Remove rattle, emergency brakes.
- 643. True up brake drums.

7. STEERING & FRONT AXLE.**70. COMBINATION WORK.**

- 701. Overhaul steering gear assembly.
- 702. Line up steering.

71. AXLE.

- 711. Install new front axle.
- 7112. Straighten front axle.

72. SPINDLES.

- 7113. Rebush front axle.
- 721. Rebush steering spindles.
- 7212. Install new steering spindle, left.
- 7213. Install new steering spindle, right.

73. STEERING GEAR AND POST.

- 731. Tighten gear and post to frame.
- 7312. Adjust gear.
- 7313. Rebush steering post.
- 7314. Rebush steering cross shaft.
- 7315. Tighten steering arm.
- 7316. Repack steering housing.

74. STEERING CONNECTING ROD.

- 741. Install new rod.
- 7412. Adjust steering connecting rod.

75. STEERING CROSS ROD.

- 751. Install new steering cross rod.
- 752. Remove rattle, steering cross rod.

76. SPARK AND THROTTLE CONTROL.

- 761. Overhaul control assembly.
- 762. Rebush control assembly.
- 763. Remove rattle, control assembly.

8. ELECTRICAL SYSTEM.**80. BATTERY.**

- 801. Install new battery.
- 802. Recharge battery.
- 803. Test battery.

81. GENERATOR.

- 811. Overhaul generator.
- 8112. Install new generator.
- 8113. Clean armature and brushes.
- 8114. Cut down commutator.
- 8115. Adjust regulator or third brush.
- 8116. Install new brushes.
- 8117. Repair generator drive.

82. STARTING MOTOR & SWITCH.

- 821. Overhaul starting motor.
- 8213. Repair starting motor.
- 8214. Repair starting motor drive.
- 8215. Clean commutator and brushes.
- 8216. Install new brushes.
- 822. Overhaul starting switch.
- 8223. Repair starting switch.

83. LAMP AND HORN.

- 831. Rewire all light lines.
- 8312. Install new bulbs.
- 8313. Repair headlamp.
- 83131. Adjust and focus headlamps.
- 8314. Install new glass, headlamp.
- 8315. Install new tail lamp.
- 8316. Rewire tail lamp circuit.
- 832. Install new horn.
- 8322. Repair horn.
- 8323. Adjust horn (tone).
- 833. Repair dash lamp.

84. IGNITION.

- 841. Overhaul ignition head.
- 8412. Install new ignition head.
- 8413. Rewire ignition system, low tension.
- 8414. Rewire ignition system, high tension.
- 8415. Check ignition timing.
- 842. Install new ignition coil.
- 8422. Install new resistance unit.
- 843. Clean and adjust spark plugs.
- 8432. Install new spark plugs.

85. AMMETER.

- 851. Install new ammeter.
- 8512. Repair ammeter.
- 8513. Rewire ammeter circuit.

86. IGNITION & LIGHT SWITCH.

- 861. Install new switch.
- 8612. Repair switches.
- 8613. Install new fuses.

87. MAGNETO.

- 871. Overhaul magneto.
- 8711. Install new breaker points.
- 872. Install new magneto.
- 873. Clean and adjust magneto.
- 874. Recharge magneto.

9. BODY.

- 901. Remove and install body.
- 9012. Take rattle out of doors.
- 9013. Repair door panel.
- 9014. Repair center panel.
- 9015. Repair forward panel.
- 9016. Repair rear panel.

91. WINDSHIELD.

- 911. Repair windshield.
- 9112. Install new glass, upper.
- 9113. Install new glass, lower.
- 9114. Take rattle out of windshield.

92. TOP AND CURTAINS.

- 921. Repair side quarter.
- 9212. Repair top half.
- 9213. Repair rear curtain.
- 92131. Install new light in rear curtain.
- 9214. Install new lights in curtains.
- 9215. Install new set curtains.
- 9216. Repair curtain door carriers.
- 9217. Install new top complete.
- 9218. Redress top.
- 9219. Straighten top bows.

An Analysis of the Farmer's Truck Needs Based on Actual Experience

In Four Parts—Part IV—Save This Valuable Data. Dealers will find profitable use for this information from 753 reports from farmer truck owners, compiled by H. R. Tolley, scientific assistant, and L. M. Church, assistant in farm accounting of the United States Department of Agriculture.

CONCLUDED FROM LAST WEEK.

THE kind of tires which a man prefers depends considerably upon the size of his truck and the kind of tires which he now uses. Four hundred and seventy-seven of these 637 men recommend the same kind of tire equipment as they are now using, and doubtless in a majority of these cases the kind of tires now used is the same as the kind with which the truck was equipped when it was purchased.

A large percentage of the owners of the $\frac{1}{2}$ -ton and $\frac{3}{4}$ -ton trucks consider pneumatics the best; the owners of the 1-ton trucks are about evenly divided in their preference, and a large percentage of the owners of trucks larger than 1 ton prefer solid tires. The exact number of owners of trucks of different sizes, and their recommendations, is as follows:

- Of 135 owners of $\frac{1}{2}$ -ton trucks—
 - 129 recommend pneumatics.
 - 5 recommend solids.
 - 1 recommends pneumatics in front and solids in the rear.
- Of 92 owners of $\frac{3}{4}$ -ton trucks—
 - 64 recommend pneumatics.
 - 25 recommend solids.
 - 3 recommend pneumatics in front and solids in the rear.
- Of 278 owners of 1-ton trucks—
 - 111 recommend pneumatics.
 - 120 recommend solids.
 - 47 recommend pneumatics in front and solids in the rear.
- Of 54 owners of $1\frac{1}{4}$ - and $1\frac{1}{2}$ -ton trucks—
 - 8 recommend pneumatics.
 - 44 recommend solids.
 - 2 recommend pneumatics in front and solids in the rear.
- Of 65 owners of 2-ton trucks—
 - 9 recommend pneumatics.
 - 52 recommend solids.
 - 4 recommend pneumatics in front and solids in the rear.
- Of 13 owners of trucks over 2 tons in size, all recommend solids.

RELIABILITY

The reliability of a motor truck, as that of any other machine, has a very decided effect upon its profitableness. If a truck is out of commission for several days at a time when its services are needed and when its owner is depending upon it to help him through a busy time it can scarcely be considered a profitable machine for him to own. Likewise, if a great deal of time is lost on the road on account of motor and tire trouble, breakage, and other delays, this loss and annoyance may overcome all the advantages attending its use. In order to obtain information as to the reliability of motor trucks for farm use these truck owners were asked to give both the number of days their trucks had been out of commission when needed during the past year, and the percentage of the time lost while using them. Table XVIII shows the average number of days 682 trucks of different ages were out of commission during the year preceding the time of reporting. The reports indicated that there is practically no difference in this respect among the trucks of different sizes.

The total number of days the trucks of different ages were out of commission is as follows:

- Of the 187 which had been in use 12 months or less—
 - 157 were out of commission no days.
 - 23 were out of commission from 1 to 5 days.
 - 5 were out of commission from 6 to 10 days.
 - 2 were out of commission over 10 days.

TABLE XVIII.—Days per year trucks were out of commission when needed.

Age of trucks (months).	Total number of reports.	Average days out of commission.
12 and less.....	187	0.7
13 to 24.....	245	1.7
25 to 36.....	147	2.0
37 and over.....	103	3.2
All.....	682	1.7

Of the 245 which had been in use 13 to 24 months—
173 were out of commission no days.

44 were out of commission 1 to 5 days.
18 were out of commission 6 to 10 days.
10 were out of commission over 10 days.

Of the 147 which had been in use 25 to 36 months—
93 were out of commission no days.

39 were out of commission 1 to 5 days.
10 were out of commission 6 to 10 days.
5 were out of commission over 10 days.

Of the 103 which had been in use 37 months or more—
56 were out of commission no days.

32 were out of commission 1 to 5 days.
9 were out of commission 6 to 10 days.
6 were out of commission over 10 days.

Seventy-one per cent of the trucks had not been out of commission at all when needed, 20 per cent had been out of commission 5 days or less, 6 per cent had been out of commission from 6 to 10 days, and 3 per cent had been out of commission over 10 days. In general, the newer trucks are more reliable than the older ones. While nearly 85 per cent of the trucks which had been owned 12 months or less had not been out of commission when needed, only a little more than one-half of those which had been in use more than 3 years had not been out of commission during the preceding year.

The average percentage of time lost on account of motor and tire trouble, breakage, etc., by 542 men owning trucks of different ages is shown in Table XIX.

TABLE XIX.—Per cent of time lost by trucks of different ages on account of motor and tire trouble, breakage, etc.

Age of truck (months).	Number of reports.	Average per cent of time lost.
12 and less.....	155	0.6
13 to 24.....	190	1.1
25 to 36.....	120	1.6
37 and over.....	77	1.6

The estimates of the men who had used their trucks different lengths of time were as follows:

Of 155 who had used their trucks 12 months or less—
122 reported the loss of no time.

32 reported the loss of 1 to 5 per cent.
1 reported the loss of more than 10 per cent.

Of 190 who had owned their trucks 13 to 24 months—
130 reported the loss of no time.

52 reported the loss of 1 to 5 per cent.

- 7 reported the loss of 6 to 10 per cent.
 1 reported the loss of more than 10 per cent.
 Of 120 who had owned their trucks 25 to 36 months—
 73 had reported the loss of no time.
 39 reported the loss of 1 to 5 per cent.
 6 reported the loss of 6 to 10 per cent.
 2 reported the loss of more than 10 per cent.
 Of 77 who had owned their trucks 37 months or more—
 39 reported the loss of no time.
 34 reported the loss of 1 to 5 per cent.
 3 reported the loss of 6 to 10 per cent.
 1 reported the loss of more than 10 per cent.

The newer trucks are more reliable in this respect, just as they are in respect to the amount of time they are out of commission when needed. Eighty per cent of the men whose trucks have been in use 12 months or less stated that they lost no time, and only one-half of the men whose trucks have been in use more than 3 years stated that they had lost no time. In all, 67 per cent of the total stated that they had lost no time, and only 1 man in 26 stated that more than 5 per cent of the time was lost on this account.

The average distance crops are hauled by these men is about 10 miles, and the average time required for the round trip is not far from 3 hours (see Table IV). A loss of 5 per cent of the time on such a trip would mean a delay of about 20 minutes. Such delays, even with the trucks which give the most trouble in this respect, would scarcely be as serious as the loss due to having the truck out of commission several days when it was needed.

To a certain extent the reliability of a motor truck depends upon the ability of the operator and the care which the truck is given. Roughly, about 60 per cent of these trucks are operated by their owners, about 30 per cent by the sons of the owners, and about 10 per cent by hired men. Automobiles are owned on about three-fourths of the farms and tractors on about one-fourth of them. It is to be expected that the owner of such an expensive machine as a motor truck, or any member of his family, would give it a reasonable amount of care and operate it with a reasonable degree of intelligence, and the fact that automobiles or tractors were owned on a large percentage of these farms indicates that most of the operators were more or less skilled in the operation of gas engines. That such a large percentage of these trucks were operated without any loss of time and were always ready for work when needed is very probably partially due to these facts.

COST OF OPERATION

The cost of operating trucks of different sizes reported by these men is shown in Table XX. The items considered in making up these costs are depreciation, repairs, interest on investment, registration and license fees, cost of gasoline and oil, and of tires.

TABLE XX.—Cost of operating trucks of different sizes.

	Size.				
	½-ton	¾-ton	1-ton	1½- and 1¾-ton	2-ton
Fixed charges:					
Annual depreciation.....	\$91	\$184	\$152	\$256	\$312
Annual repairs.....	50	75	75	100	150
Annual interest.....	21	45	33	68	83
Annual registration and license fees.....	10	15	18	22	26
Total fixed charges.....	172	319	278	441	571
Miles traveled per year.....	3,790	4,370	3,660	3,100	4,070
Fixed charges per mile.....	\$0.045	\$0.073	\$0.076	\$0.142	\$0.140
Gasoline and oil per mile.....	.021	.025	.027	.031	.038
Tires per mile.....	.016	.029	.016	.017	.025
Total cost per mile.....	.082	.127	.119	.190	.203

The figures for annual depreciation are obtained from Table XIV; in last week's issue.

Interest is figured at 6 per cent on the average investment.

The average investment has been found by the rule: An average investment = first cost $\times \frac{\text{years of service} + 1}{\text{years of service} \times 2}$. This

is the generally accepted method for determining the average investment in equipment where a fraction of the first cost is charged off each year for depreciation. The interest charge when computed on this basis is slightly greater than when computed on one-half of the first cost.

No charge has been made for taxes, insurance, housing, or labor spent in caring for the truck. However, these items would ordinarily amount to a very small percentage of the total cost.

The number of miles traveled per year were shown in last week's issue. The gasoline and oil charges are obtained from Table XVI, and the tire charges from Table XVII. The tire charges for the ½-ton, ¾-ton, and 1-ton trucks are for pneumatic tires, while for the 1¼-ton, 1½-ton, and 2-ton trucks the tire charges are for solid tires.

COST OF HAULING WITH TRUCKS

The cost of hauling with a motor truck is determined by the cost of operating the truck, the charge for the driver's time and labor, the size of load hauled, and the percentage of time the truck runs without a load. In Table XXI are given the cost per mile of haul, and the cost per ton-mile of handling crops with trucks of different sizes. The cost of operating the truck is taken directly from the preceding table. The charge for the driver is obtained by allowing a rate of 50 cents per hour for his time while driving and while loading and unloading the truck. The average time required for hauling different materials as given in Tables IV to VII is 0.14 hour per mile of travel for the ½- and ¾-ton trucks, and 0.15 hour for the 1-, 1¼-, 1½-, and 2-ton trucks.

It was stated previously that these men had return loads for their trucks about 26 per cent of the time; that is, each truck hauls loads both ways on 26 out of every 100 round trips it makes from and to the farm, and runs without a load 74 one-way trips. The cost of operating the truck and the value of the driver's time for these 74 trips with no load must be charged to the 126 trips with loads, in order to obtain the actual cost per mile of haul. That is, every 126 miles of haul must bear the expense of 200 miles of travel, or every 63 miles of haul must bear the expense of 100 miles of travel. The cost per mile of haul as given in the table is obtained by multiplying the total cost per mile traveled by 100 and dividing the product by 63.

The cost per ton-mile hauled is determined by dividing the cost per mile hauled by the weight of the load in tons. As shown in Table IV, the average weight of a load of crops hauled with ½-ton trucks is 0.480 ton; for ¾-ton trucks the load is 0.926 ton; for the 1-ton trucks, 1.196 tons; for 1¼-ton and 1½-ton trucks, 1.734 tons; and for the 2-ton trucks, 2.464 tons. The costs per mile of haul for the trucks of different sizes divided by these figures give the costs per ton-mile.

TABLE XXI.—Cost of hauling with trucks of different sizes.

Size of truck.	½-ton.	¾-ton.	1-ton.	1½- and 1¾-ton.	2-ton.
Truck cost per mile run.....	\$0.082	\$0.127	\$0.119	\$0.190	\$0.203
Charge for driver per mile run.....	.070	.070	.075	.075	.075
Total.....	.152	.197	.194	.265	.278
Cost per mile of haul (37 per cent idle running).....	.241	.313	.308	.421	.441
Cost per ton-mile for hauling crops.....	.502	.338	.258	.242	.179

SAVING OF HIRED HELP

The saving of time is given by these men as the greatest advantage in the use of a motor truck, but the saving of time will not be of any financial benefit to a farmer unless he uses the time thus saved on other work, or unless it enables him to reduce the expense for hired help.

These men were asked whether or not their trucks reduce the expense for hired help, either man or horse, and, if so, to estimate the amount thus saved per year. Of 711 men who answered the question as to whether the truck reduces the

expense for hired help, 562, or 79 per cent, said that it does, and the remaining 149 that it does not.

Three hundred and fifty of the 561 estimated the amount thus annually saved, and the average of these estimates is \$324. This figure can scarcely be taken to represent the actual amount which the labor bills of these men have been reduced since purchasing their trucks, but rather as their estimates of the amounts by which their bills would be increased if they did not now own trucks, and if they were doing the same amount of work they are now doing.

Eighty-four per cent of the operators of fruit farms think that their trucks reduce the expense for hired help. This is a slightly higher percentage than is reported for any other type of farming. The average of the estimates of those of this 84 per cent who attempted to place a value on the amount of help saved is \$364.

The owners of the larger trucks make higher estimates of the amount that their trucks reduce expenses than do owners of the smaller ones. The averages of the estimates of the owners of the $\frac{1}{2}$ -ton, $\frac{3}{4}$ -ton, and 1-ton trucks, who report that their trucks reduce the bill for hired help, were all between \$250 and \$300, the average of the estimates of the owners of the $1\frac{1}{4}$ -ton and $1\frac{1}{2}$ -ton trucks was between \$375 and \$400, while the estimates of the owners of the 2-ton trucks and of those over 2 tons averaged more than \$600. There is no great difference in the percentage of the owners of the different sizes who consider that their trucks do not reduce the expense for hired help.

DISPLACEMENT OF HORSES

The operators of 610 farms reported the number of head of work stock they owned before purchasing their trucks and the number they had disposed of since that time. Four of these 610 farms were small ones which had been operated without horses even before trucks were purchased. The number of head of work stock kept on the other 606 farms varied from 1 or 2 on the smaller farms to 20 and more on a few of the larger ones. The total number of work stock kept on the 606 farms was 3,103. On 296 of them the number had been reduced since the trucks were purchased by a total of 586 head, an average reduction of 19 per cent for the 606 farms and an average displacement of 1.0 head per truck.

A man with only 1 or 2 horses will usually need to keep them for work on the farm even after buying a truck, and only about 1 man in 7 who owned 1 or 2 horses had sold any since buying his truck. Similarly, the purchase of a motor truck will not often enable a man who owns 3 or 4 horses, all of which he sometimes uses as a single unit, to reduce the number of his work stock. A little less than one-half of the men who had owned 3 or 4 horses before purchasing their trucks reported that they had disposed of any since that time, but nearly two-thirds of those who had owned 5 or more had disposed of at least 1 after purchasing the truck. The exact number of work stock formerly owned and the number disposed of by the different men is as follows:

Of 90 men who owned 1 or 2 head before purchasing trucks—
77 had disposed of none.
10 had disposed of 1.
3 had disposed of 2.

Of 232 men who owned 3 or 4 head before purchasing trucks—
130 had disposed of none.
59 had disposed of 1.
42 had disposed of 2.
1 had disposed of 3.

Of 156 men who owned 5 or 6 head before purchasing trucks—
66 had disposed of none.
35 had disposed of 1.
43 had disposed of 2.
8 had disposed of 3.
4 had disposed of 4.

Of 63 men who owned 7 or 8 head before purchasing trucks—
16 had disposed of none.
7 had disposed of 1.
25 had disposed of 2.
5 had disposed of 3.
10 had disposed of 4.

Of 34 men who owned 9 or 10 head before purchasing trucks—
8 had disposed of none.
1 had disposed of 1.
10 had disposed of 2.
4 had disposed of 3.
5 had disposed of 4.
6 had disposed of 5 or more.

Of 31 men who owned 11 or more head before purchasing trucks—
13 had disposed of none.
2 had disposed of 1.
4 had disposed of 2.
3 had disposed of 3.
3 had disposed of 4.
6 had disposed of 5 or more.

This displacement of horses by motor trucks is quite comparable to the displacement by tractors in this section. A study of 252 New York farms on which tractors are owned showed that on these farms the total work stock owned when the tractors were purchased amounted to 1,321, while the total after the purchase of tractors was 1,018, a reduction of 22 per cent, and an average displacement of 1.2 head per tractor.

FARMS ON WHICH TRACTORS ARE OWNED

Of 675 men who reported on whether or not they own tractors, 180, or 27 per cent, stated that they own tractors. Tractors are owned on a larger percentage of the crop and fruit farms than on farms of other types. They are owned on 9 per cent of the truck farms, 33 per cent of the dairy farms, 38 per cent of the fruit farms, 42 per cent of the crop farms, and 25 per cent of the general farms. Size of the farm, however, evidently had a greater influence in this regard than did the type of farming. The number of men with farms of different sizes (crop acres, not total acres), who do and do not own tractors, is as follows:

Of 243 men with 60 or less crop-acres—
21 own tractors. 222 do not own tractors.

Of 227 men with 61 to 120 crop-acres—
47 own tractors. 180 do not own tractors.

Of 103 men with 121 to 180 crop-acres—
42 own tractors. 61 do not own tractors.

Of 45 men with 181 to 240 crop-acres—
31 own tractors. 14 do not own tractors.

Of 30 men with 241 to 300 crop-acres—
20 own tractors. 10 do not own tractors.

Of 27 men with 301 or more crop-acres—
19 own tractors. 8 do not own tractors.

Over two-thirds of the 675 farms consisted of not over 120 crop-acres. Tractors are owned on only about 15 per cent of such farms, while they are owned on 55 per cent of those with more than 120 crop-acres. In most cases the reports did not show the size of the tractor owned, but at least a part of the tractors owned on the 21 farms with 60 or less crop-acres are small ones of only one or two draw-bar horsepower, and are capable of doing the work of only about one horse.

The ownership of both motor trucks and tractors, even on the large farms, has not resulted in a very great reduction in the number of horses. The men who own both trucks and tractors and who have from 61 to 120 crop-acres still keep nearly 4 horses on the average—one horse for each 24 crop-acres—and only 6 of them are farming with fewer than 3 horses. The men who have from 121 to 180 crop-acres still keep an average of 5 horses—one for each 30 acres—and only six of them are now farming with fewer than 4 horses. The men who have over 180 crop-acres still keep an average of between 8 and 9 horses—one to each 39 crop-acres—and only 3 of them are farming with fewer than 4 horses.

The number of crop-acres per horse on the farms of different sizes where trucks are owned, but not tractors, is only about 2 acres less in each case than on the farms where tractors are owned, there being 22 crop-acres per horse on the farms with 61 to 120 crop-acres where tractors are not owned, 28 per horse on those with 121 to 180 crop-acres, and 37 per horse on those with over 180 crop-acres.

THE END

Institutional Advertising Will Help

If You Have the Facilities for Rendering the Right Kind of Service Let the Town Know About It

HAVE you ever thought about telling your town about how well equipped you are to render service? You may have told them all there is to tell about the car, truck or tractor you are selling, but how about your institution? How about the new machine you have installed that cuts down the cost of a certain repair job and which, incidentally, means the customer will be charged less? Does he know that you have this machine and that henceforth he might expect a reduction in the charge for the job? Do your customers or potential customers know that every department of your service station is highly specialized and every mechanic a specialist in his line?

The Eldridge-Buick Co., Seattle, Wash., recently ran a series of institutional ad-

vertisements in a local paper which was directed to the Buick owners so that they might get better acquainted with what was behind their investment in motor transportation.

We show reproductions of two of the advertisements. One of these is directed at some of the special equipment this company uses and the other to the parts department. Some of the high spots in the text of these ads and others used by the company are the following:

"Back of every investment whether it be motor transportation or washing machines you want one thing and that thing only—SERVICE.

"You will find over twenty-four special tools and machines in the Buick shop which have been designed and installed for the benefit of our customers.

"Owners of Buick automobiles and

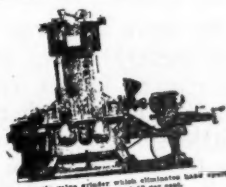
GMC trucks are benefitted by these labor-saving devices which make possible a higher quality of workmanship and save time and money.

"When you drive up your Buick car a service salesman will meet you at the door. He will diagnose your needs, write up your order and direct your Buick on its way through the various departments. He works with one aim—better service at the lowest possible cost to you. The same service salesman has graduated from every mechanical department of this house. His knowledge and experience are yours for the asking. That's Eldridge Buick Service."

In its advertisements the company also points out that when one buys a car or truck from the organization he becomes a part of the family and is guaranteed cooperation.

The House That Cooperation Built

Everybody interested in motor transportation will be keenly interested in the special shop equipment in our Retail store, 802-808 East Pike Street. In our Buick Shop you'll find special labor saving devices unmatched by anything on the Coast. You'll find over 24 special tools and machines in the which have been designed and installed for the benefit of our customers.

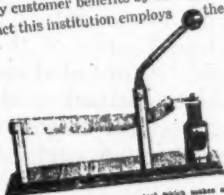


Automatic valve grinder which grinds valves and seats in 10 per cent.

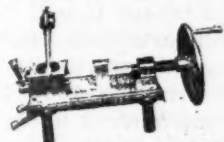


A cleaning view of the grinding machine.

One of these, the automatic Valve-Grinding Machine, made and patented by the employees, reduces the time on any job 50 per cent. Owners of Buick automobiles and GMC trucks are benefitted by these labor-saving devices which make possible a higher quality of workmanship, and save time and money. Every department is highly specialized and every mechanic is a specialist in his line. Every customer benefits by this specialization. In fact this institution employs the finest class of mechanics in the Northwest.



The valve spring compressor, a tool which makes a difficult job simple.



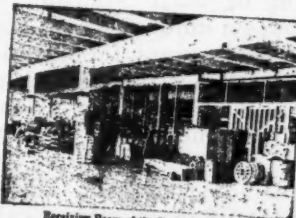
The piston press, which eliminates all danger of distorting pistons.

Telephone us at East 842, or call and we will be glad to personally conduct you through this establishment and you can see with your own eyes what comprises Eldridge Buick Service.

70 Buick and GMC Dealers in the Northwest.
70 Buick and GMC Service Stations in the Northwest.
70 more Reasons why you should own a Buick or a GMC.

ELDRIDGE Buick COMPANY
SEATTLE SPOKANE YAKIMA WALLA WALLA
The Home of the GMC Truck

The House That Cooperation Built



Receiving Room of the Parts Department.



View of the Spacious Parts Department.



A Cross-Section showing Parts Arrangement.

Back of every investment whether it be motor transportation or washing machines you want one thing and one thing only—SERVICE.

PARTS

Every owner of a Buick automobile or a GMC truck is guaranteed parts when he needs them.

The Eldridge Buick Retail and Wholesale Parts Department at 1402 Eleventh Avenue, with a sufficient stock of Buick and GMC parts covers a floor area of 15,360 square feet.

Including the Northwest Dealer Organization there is an ample stock of parts immediately available for the servicing of Buick automobiles and GMC trucks.

DEALERS

Back of this house is a dealer organization that stands at the head of the line on the Pacific Coast. Every Buick or GMC dealer is first of all a man of high calibre, one who is a builder in his community life. Wherever you go you'll find no higher class of men than those who comprise this Buick and GMC Dealer Organization.

Go where you will on the principal highways of the Northwest you'll always find a Buick or GMC Service Station not far away.

From the northern border of Alaska, to the southern border of Oregon; from the Pacific Ocean to the eastern border of Idaho, you'll find a class of Service that is uniform throughout. SERVICE THAT SATISFIES, and "WHEN BETTER SERVICE IS GIVEN, ELDRIDGE BUICK WILL GIVE IT."

This institution is at your Service. You're cordially invited to make it your automobile home.

70 Buick and GMC Dealers in the Northwest.

70 Buick and GMC Service Stations in the Northwest.

70 more Reasons why you should own a Buick automobile or GMC Truck.

ELDRIDGE Buick COMPANY
SEATTLE SPOKANE YAKIMA WALLA WALLA
The Home of the GMC Truck

Here are two of the advertisements used by the Eldridge Buick Co. It is one of the few instances where a motor car concern has told of its equipment in the newspapers



EDITORIAL



The 500-Mile Race

THERE still are a good many who look upon automobile racing as a sport. They are of the opinion that an event like the Indianapolis 500-mile race represents just so much gasoline wasted, the endangering of many lives and a money making proposition.

True, it does take a lot of gasoline; it does put a good many lives into jeopardy and, so far as we know, probably pays the promoters a certain profit.

To those who have the automotive industry close at heart automobile racing no longer is considered as a sport. If this were so, we should not find men connected with the industry devoting their time to the designing and construction of a fleet of race cars. In a sense, an event like the Indianapolis race is a great laboratory in which experiments are conducted which ultimately result in the betterment of automobiles.

We may condemn racing as a dangerous sport but do we stop to realize, for instance, that the design and steel used in the steering spindle of our automobile is largely the result of what someone has learned on the race track. Just now there is quite a bit of talk regarding smaller engines for our passenger cars, the thought being that it is wasteful and highly inefficient to use a large engine when a small one turning at high speed will do the work. We have seen proof of this for two years on the race track. The 183 cu.-in. engine has demonstrated on the race track that it can out perform engines of larger cubic inch capacity when it comes to speed and endurance. It is not uncommon at a race now to have one of these small powered cars go the entire distance without a stop for fuel or adjustments.

What we see on the race track today in the way of development we find incorporated materially in our commercial cars of tomorrow. The race track has paved the way for the betterment of American and European cars for many years and probably will do so for some time to come.



"An Indispensable Instrument"

"THE motor car has become an indispensable instrument in our political, social and industrial life." Thus, through this sentence in his first address to Congress since his inauguration, has President Harding given recognition to the essentiality of the motor car in all walks of American life. It is important. President Harding did not speak as a private citizen voicing an individual opinion but as the chief executive whose views are expressed only after complete knowledge of conditions has been obtained through the innumerable channels at his disposal. Luxury? President Harding says clearly that the automobile is not to be put in that classification.

It is a healthy sign of the times. While the automobile industry is fast on the road to recovery, leading all business back to normal, President Harding's enunciation should further stimulate sales; it should lessen sales resistance; it should have a wholesome effect on bankers who have money to lend and who are hesitant; and what it should do above all else is to impress upon legislators, national, state and local, the relation the industry bears to American progress.

In view of the essentiality to such progress is it proper to assume by anyone that the industry should be made the special object of unjust taxation and robbed of its ability to render the fullest service through indiscriminatory taxes imposed on it by every legislative body from the Congress of the United States to the most local body empowered to make a levy? Overburdening taxes will do much to snatch from the industry the very importance that President Harding attaches to it.



More Carrying Space

WHILE we have progressed wonderfully well with the design and construction of our modern cars, there is one thing that still seems to be worthy of the men to whom we must look for development in our cars. That one thing is more carrying space.

This especially is true of the more moderate priced touring cars. Roadsters as a general thing are provided with a spacious compartment in the rear and it is doubtful if improvement is necessary there. But in many of our cars only a little space is provided for carrying tools, etc., under the front seat, while a shallow space, often only 3 or 4 in. is provided under the back seat, probably just enough to take the top boot and curtains. If a car owner wishes to take along any extra luggage he must strap it to the running board, or carry it on the floor of the tonneau.

Perhaps it will be possible in the future to provide compartments under the floor boards of the tonneau, so that carrying space would be provided on each side of the drive-shaft tube. Also, instead of the shallow compartment under the rear seat it might be possible to arrange for deep boxes, one on each side of the differential housing. Thus plenty of clearance would be provided and the owner would have increased carrying space. Perhaps some designer will come forth with some form of floor board that can be swung out of place in the twinkling of an eye and expose to view the luggage compartments.

THE automobile business is one of the greatest businesses in the world and the possibilities for future expansion are unlimited. The dealer who is intelligent, conservative and has faith in the industry is building up the efficiency of his business to a greater degree than ever before. The fair weather business man is gradually disappearing.

Taxes Before Commerce Body

*Industry's Attitude on Taxation Program Set Forth By
Representatives of Various Branches of United States
Chamber—Ask Only for Justice*

ATLANTIC CITY, April 29—Stabilization of the world's industry is the most important problem confronting America.

This was the message brought by bankers and captains of industry to the business men of the country gathered here for the annual convention of the Chamber of Commerce of the United States. All the other questions calling for solution must be viewed in the light of world needs, declared the spokesmen of finance and industry.

Domestic taxation, in the opinion of these men, can be brushed aside as unimportant in comparison with the stabilization of international trade. This nation, with its limitless wealth, can better afford, they said, to relinquish the import revenues than to build up a tariff wall which will keep idle the factories in other lands.

The time has come, it was contended, for the great masses of Americans to think internationally. The men who forecast the post-war readjustment which began a year ago and who warned the nation that deflation was inevitable, now are equally insistent that there can be no genuine prosperity in the United States and no return to normal until the rest of the world settles down to the Herculean task of setting its house in order.

They warned that if the United States refuses to heed the cry of civilization, and tries to live within itself by adopting a policy of isolation the country eventually will lose its prestige as the foremost nation in the world and sink into a position of semi-obscurity as a second rate power.

NATIONS OF THE WORLD INTER-DEPENDENT

They told the millions of Americans who feel that we have little concern in the affairs of Europe that American factories never will run at capacity production, that American farms never will feed the world and that millions of Americans will always be unemployed until economic conditions in other lands permit their people to settle down to the pursuits of peace. The interdependence of nations never was so pronounced as it is today and even the United States is not exempt.

As speech after speech was made it almost seemed that the men who prepared them had collaborated in the task. Their tenor was remarkably similar. The thought in all was the same. None denied that tariff and taxation are important subjects but they were put in second place. These two subjects, however, were the main considerations for most of the 4,000 men attending the con-

vention and their consideration consumed a good share of the time of the various group meetings.

In relation to taxation, the program originated by the National Automobile Chamber of Commerce was endorsed by a majority of delegates and alternates voting at group meetings yesterday. They were asked to vote on these four questions:

Should the excise tax be repealed except on liquor, tobacco, narcotics and snuff?

Should there be an increase in the income tax?

Should there be a sales tax?

Should there be a resort to loans?

EXCISE TAXES CLASSED AS DISCRIMINATORY

It was stated unofficially that a majority favored repeal of excise taxes and imposition of a sales tax if additional revenues are needed to meet the expenses of the government. These were the major points upon which the automotive industry united for its fight. Besides the N. A. C. C., the organizations which stood shoulder to shoulder for this program included the National Automobile Dealers' Association, the Motor & Accessory Manufacturers' Association and the Rubber Association of America.

The major presentation on the subject was made by C. C. Hanch, chairman of the N. A. C. C. tax committee. He was seconded in his efforts by C. A. Vane, general counsel of the N. A. D. A., Alfred Reeves, general manager of the N. A. C. C., and M. L. Heminway, general manager of the M. A. M. A.

It was contended that to place excise taxes on certain industries was unjust and discriminatory. They were accepted as a patriotic duty while the nation was at war but it was held that industries which then were catalogued, justly or unjustly, as non-essential, in the days of peace than the making of munitions. The industries now paying discriminatory excise taxes have billions of dollars of capital invested and they employ millions of workers. Under a referendum vote taken some time ago the Chamber of Commerce decided in favor of a continuation of these taxes and for that reason the delegates were asked to vote again on the subject with the result that a majority seemed to favor repeal of the discriminatory impost.

This was the major plea of the automotive industry. Its representatives declared it was ready and glad to bear its full share of tax burdens but that it would fight to the end against injustice. It was asserted that if there were strict economy in government and that if the

bonded debt were funded to cover a term of years, the excess profits tax could be repealed as a stimulus to business and the Federal government still have funds ample for its needs.

There was full realization, however, that there should not be too much optimism on the subject of economy and that if present revenue producing measures are thrown into the discard some substitute tax measure must be presented to Congress. It was believed that a retail sales or consumption tax would be the fairest and least difficult to collect.

While a majority of the delegates seemed to favor a sales tax if more money must be raised after repeal of the excess profits taxes, there was no illusion over the opposition this plan will encounter in Congress. Something of what might be expected along this line was indicated in a speech by Representative James G. Good of Cedar Rapids, Iowa, chairman of the House Committee on Appropriations. It is Good who has persisted in the assertion that the 9,000,000 passenger carrying automobiles in the United States should be subjected to a "wheel tax" which would produce a revenue of \$150,000,000. He reiterated his allegation that such a tax "would involve no hardship" and that the Federal government is spending \$100,000,000 a year building highways "for the convenience of automobiles."

STRICT ECONOMY TO REDUCE NEEDS TO \$3,500,000,000

Good read dizzying statistics of national expenditures but contended that by strict economy and the funding of the war debt the annual appropriations could be reduced to \$3,500,000,000. He advocated repeal of excess profits taxes and proposed that the deficit be made up by increased imposts on items such as tobacco, automobiles and liquor withdrawn from bonded warehouses.

He expressed unalterable opposition to a sales tax and predicted dire consequences if one were enacted. He contended that it would shift the burden from those best able to pay to the backs of those who would be compelled to pay regardless of their ability. To do this in a period of unrest, when there are millions of unemployed, he asserted, would arouse resentment against private property and even against the government itself. Unjust consumption taxes cost Great Britain her American colonies, he said, and he argued that the major share of the tax burden must remain on those best able to pay.

While Good's statistics on government expenditures were staggering he pointed out that the United States has no finan-

Concluded on page 26

Jordan Makes Cut in Prices Ranging from \$600 to \$900

No Reductions are Contemplated by Stearns or Winton Among Cleveland Manufacturers

CLEVELAND, April 29—Effective May 1, 1921, prices for Jordan cars will be reduced \$600 to \$900, according to announcement made by E. S. Jordan, president of the Jordan Motor Car Co. Officials of the company say it is the most pronounced cut made in the price of cars since the war not excepting the reduction made by Henry Ford last September.

The new schedule of prices is herewith compared with the prices that prevailed in September of last year:

	May 1, 1921	Sept. 1, 1920
5-Passenger Touring.....	\$2250	\$2850
Roadster	2250	2850
7-Passenger Touring.....	2475	3075
4-Passenger Enclosed		
Brougham	3300	3950
5-Passenger Sedan.....	3300	3900
7-Passenger Sedan.....	3700	4200
Custom Landaulet.....	3300	4200

Speaking of the reductions, Mr. Jordan says: "The automobile business is coming back. We are very fortunate in that we have liquidated all our inventory and we are buying and producing on a quantity basis. Our production has now reached 100 per cent and the new price will justify itself by doubling our production, thereby greatly reducing our overhead. We find that the purveyors of materials are willing to grant price concessions when a firm order for material is offered to them. The Jordan company always has been in a strong financial condition. In spite of slow production during the winter all obligations were met in a satisfactory manner."

W. B. Riley, salesmanager, said his salesmen and distributors would be instructed to emphasize that the Jordan people have made a bona fide revision of prices downward since September, 1920. It cannot be shown that this company raised prices after announcing cuts in September or October of last year.

So far as could be learned other automobile producers in this city will not immediately follow the Jordan example.

Other Makers Announce Stand

"We do not intend to reduce the price of our car in the slightest," said G. W. Booker, president of the F. B. Stearns Co. "We did not increase the price of our product last year as other manufacturers did because we had contracted for material well in advance at lower prices than we are now paying for certain parts that go into the car."

George H. Brown, secretary-treasurer of the Winton Co., last night said that no reductions would be made in the price of the Winton cars.

"It is price stabilization that is needed to restore normal business," he said, "and not price reductions."

Indianapolis, May 2—Nurdyke & Marmon Co. has announced reductions in price of the Marmon 34, seven-passenger, four passenger and club roadster cars from \$5000 to \$3985 effective today. The Marmon reduction of over \$1000 makes the new price of \$3985 one based on the lower production cost of the next 18 months, and is a complete reduction rather than a series of minor ones, and as such should have a stabilizing influence. Reductions on the other body models are:

Model	Old Price	New Price
Speedster	\$5300	\$4185
Coupe	6150	4875
Sedan	6600	5275
Limousine	6800	5400
Town Car	6800	5400

Under the new prices all extra accessories and equipment are included as formerly. Marmon is at present running on a production basis of 5000 cars a year.

Expected to Stabilize Used Car Prices

Marmon has made no changes in discounts to distributors, sub-dealers, or direct dealers under the new prices. One reason back of the heavy reduction is that of not making any provision for long trades, thereby encouraging the over-appraising evil at a time when the used car market is heavily overstocked throughout the country. From many parts of the country have come reports of too high appraisal on cars which has brought severe criticism from many distributors handling various lines, and a decisive price reduction should stabilize rather than disturb used car values.

Chicago, May 2—A reduction of 20 per cent in tire and tube prices, effective today, has been announced by the B. F. Goodrich Co., the General Tire & Rubber Co. and the Mason Tire & Rubber Co. The present reduction brings tire prices back to the 1913 levels and about 40 per cent below 1919 prices. It is the second reduction in six months making a combined cut of 33 1/3 per cent.

Wilmington, Del., May 2—Substantial reductions on all lines of varnishes have been made by the E. I. duPont de Nemours & Co., Inc., effective today. The reductions range from 25 cents a gallon on the lower grades to \$1 a gallon on the high class product. The company declares the reductions are warranted by the reduced cost of production and by the increased volume of sales.

GAS PRICES DROP IN MIDDLE WEST

Chicago, April 29—A drop of 3 cents in the price of gasoline in Chicago and the middle western states was announced this week by the Standard Oil Co. of Indiana. This means a cut from 25 to 22 cents at the filling stations and from 23 to 20 cents on tank wagons. Kerosene prices drop accordingly from 13 1/4 to 10 1/2 cents retail.

Secretary Mellon Suggests License Tax on Automobiles

Plan of New Treasurer Differs From That Put Forward by Former Secretary Houston

WASHINGTON, May 1—Retention of excise taxes and imposing a license tax on automobiles was suggested by Secretary of the Treasury Mellon in recommendations for internal revenue revision submitted to the House ways and means committee. The application of these taxes was not explained in detail in the letter of submittal but the secretary announced that he would appear before the committee to supply further information regarding the treasury tax program.

Secretary Mellon's proposals differ widely from those of his predecessor. Under the old regime Secretary Houston had suggested additional tax levies on automotive industries calculated to yield \$290,000,000 over and above the present rate of return. The Houston plan intended to double the excise tax, levy a horsepower tax and 2 cents a gallon on gasoline. No mention was made of these propositions in the Mellon letter to Chairman Fordney but it is expected that Treasury experts will discuss the suggestions in testifying before the committee next week.

Mellon has advised Congress that the only way to stop these additional internal taxes automobile and stamp assessments to an aggregate of between \$250,000,000 and \$300,000,000 would be to cut federal expenditures.

The treasurer believes the miscellaneous specific taxes—sales taxes and excise taxes including transportation, amusement, tobacco and capital stock taxes, should be retained but fountain drink assessments and other minor taxes should be abolished. The secretary made clear that he could not recommend at this time any general sales tax, particularly if it were designed to supersede the highly productive special sales taxes now in effect on many relatively non-essential articles.

Thomas Is Winner at Third San Joaquin Valley Classic

Fresno, Cal., April 30—Joe Thomas won the third annual 150 mile San Joaquin Valley classic this afternoon in 1:29:06 4/5, an average speed of 100.4 miles an hour.

WILCOX NEWEST RACE ENTRANT

Indianapolis, April 29—Howard (Howdy) Wilcox has signed to enter the 500-mile race at the Indianapolis speedway May 30. He will drive a Peugeot, the car in which he drove to victory in the 1919 race here. Last year Wilcox teamed with Goux and Boillot but this year Boillot will drive a Talbot-Darracq while Goux will probably not come to this country. It is said, however, that a second Peugeot will be entered in the event along with Wilcox's car.

New Townsend Bill Contains President's Views on Roads

Senator Prepares Highway Measure Following Conference Held with Automotive Interests

WASHINGTON, April 29—Senator Townsend, chairman of the Senate Committee on Postoffice and Postroads, has prepared a new highway bill after conference with organizations interested in highway development, which emphasizes practically all good roads features recommended by President Harding in his recent message to Congress. The measure will be presented to the Senate late this week when the drafts are completed. The legislation represents the compromise of principles and methods but it is regarded as the most acceptable at this time and one calculated to pass without formidable opposition.

The senate bill contains many of the important features of the original Townsend bill, which was endorsed by the National Automobile Chamber of Commerce, the National Automobile Association, the Federal Highway Council, and kindred organizations. The new draft creates the Federal Highway Commission, continues Federal aid to states with drastic maintenance clauses and other marked revisions intended to abolish abuse in the distribution of Federal funds.

The \$100,000,000 fund which is appropriated for Federal aid each year is continued for two years but provisions have been inserted which restrict the distribution of the money. Not more than 3 per cent is to be expended for the administration of the Federal Highway Act for carrying on necessary highway research and investigational studies independently of any cooperation with the State Highway Departments and other research agencies. It is provided that the commission shall, after making these deductions, apportion the remainder of the appropriation for each fiscal year among the states as follows:

Proportion to States

"One-third in the ratio which the area of each state bears to the total area of all the states; one-third in the ratio which the population of each state bears to the total population of all the states, as shown by the latest available Federal census; one-third in the ratio which the mileage of rural delivery routes and star routes in each state bears to the total mileage of rural delivery and star routes in all the states, at the close of the next preceding fiscal year, as shown by certificates of the postmaster general, which he is directed to make and furnish annually to the commission. Provided: That no state shall receive less than one-half of one per cent of each year's allotment. And provided further, any amount apportioned under the provisions of this act unexpended at the end of the period during which it is available for expenditure under the terms of this section shall

be reapportioned, within sixty days thereafter, to all the states in the same manner and on the same basis."

The bill further provides: "That the commission shall establish an interstate system of highways, composed of primary interstate roads which shall, by the most practicable routes and with due consideration for the agricultural, commercial, postal and military needs of the nation afford ingress into and egress from each state and the District of Columbia. Such interstate system may include highways to and from important water ports, and highways connecting at the border with the main highways in countries adjoining the United States; but shall not include any highway in a municipality having a population, as shown by the latest available Federal census, of five thousand or more, except that portion of any such highway along which, within a distance of one mile, the houses average more than two hundred feet apart. Provided further: That all highways constructed or reconstructed under the provisions of this act shall be free from tolls of all kinds; provided: that in any state when such interstate highways or parts thereof have been constructed in accordance with a standard deemed adequate for prevailing traffic by the commission and are maintained as elsewhere provided for in this measure, the commission is authorized and directed to join with the state in the establishment and construction or reconstruction of other highways connecting or correlating with the interstate system."

Follow President's Suggestion

In order to carry out the recommendations of the president, the senate committee has inserted a proviso to the effect that no project shall be approved by the commission in any state until the state has made adequate provision for the maintenance of the highway selected by the commission in that state.

Because of the conflicts which have occurred between state highway officials and the Federal authorities, it is provided that in the case of any state failing to carry out the provisions of this agreement after construction or reconstruction of the highway, it shall be notified that after sixty days the commission will proceed to have the highway placed in a proper condition of maintenance and charge the cost against the Federal funds allotted to the state.

Conference Arranges Program

This program was reached after a conference here Monday, with the Senate Postoffice Committee, in which Pyke Johnson represented the National Automobile Chamber of Commerce. A. G. Batchelder, executive secretary, and M. O. Eldridge of the American Automobile Assn., P. M. Williams and H. G. Shirley of the Federal Highway Council; C. A. Vane, National Automobile Dealers' Assn., were spokesmen for the automotive and associated industries. Representatives of the farm organizations and American Assn. of Highway Officials were present.

Service Problems to Attract Factory Managers to Buffalo

Program for Two Day N. A. C. C. Convention in May Provides for Busy Sessions

NEW YORK, April 28—The National Automobile Chamber of Commerce has completed the program for the service managers' convention, open to representatives of the factories that are members of the N. A. C. A., and invited guests, which will be held at the Hotel Iroquois, Buffalo, May 17 and 18. The first session will be of special interest to factory engineers. For those representatives who wish to stay over to visit factory service departments and local stations special arrangements will be made.

The program follows:

Tuesday, May 17, 9:30 a. m.

Address of welcome by Col. Charles Clifton, president, N. A. C. C.

Report of service committee.

Relation which service and engineering departments should bear to each other, B. B. Bachman, engineer, Autocar Co.

Relation which service and engineering departments should bear to each other, E. V. Rippingille, service manager, Hudson Motor Car Co.

Topics for discussion.

2:00 p. m.

What does an owner expect? F. A. Bonham, service manager, Chevrolet Motor Co.

Administration of the Winton service department, W. H. Doddridge, service manager, The Winton Co.

Topics for discussion.

Wednesday, 9:30 a. m.

Equipment and Car Dealer Service Session

Address by George M. Graham, vice-president, Pierce-Arrow Motor Car Co.

Relationship between equipment and car dealers' service stations, by J. L. Elwood, vice-president and general manager, United Motors Service, Inc.

Relationship between equipment and car dealer service stations, H. Barcroft White, Chevrolet distributor at Syracuse.

Topics for discussion:

2:00 p. m.

Service department organization, F. Van Z. Lane, general maintenance manager, Hares Motors, Inc.

Some thoughts on service, J. A. Harris, Jr., vice-president, The White Co.

Topics for discussion:

How can we help prevent dealers from overstocking parts?

Should a handling charge be imposed on returned parts?

How are we to meet the "pirate" parts situation?

On what basis should the dealer collect the 5 per cent war tax?

Would a uniform telegraph code or at least a standard set of code phrases be advisable?

How should distant dealers cover transportation in parts prices?

Using the N. A. C. A. service department.

Chrysler Will Not Sever His Relations With John N. Willys

President of Great Enterprises Reports Good Conditions After Dealer Conferences

NEW YORK, April 29—Walter P. Chrysler has not the most remote intention of severing his relations with John N. Willys. The executive vice-president of the great Willys enterprises has no differences with his chief and has had none. They are in thorough accord on all questions of policy. The main object in life for both of them is to bring the Willys-Overland Co. and the Willys Corp. back to their former impregnable positions, and in this endeavor they are making splendid progress.

Willys in a long series of conferences has told his dealers the exact truth about the affairs of his company, and at last has come to the conclusion it is time to spike the insinuations that he had stepped into the background and that his relations with Chrysler have been strained to the breaking point. His positive and emphatic statement that there never have been any differences between them was made in response to an inquiry from MOTOR AGE as to whether there was any truth in the report that Chrysler soon was to join the General Motors Corp. In this denial, Willys was joined with equal emphasis by Chrysler. Willys asserted he was thoroughly "sold" on Chrysler and Chrysler declared he was "sold" on Willys and was proud to work for him. He told his chief he had no intention of going with General Motors.

Dealers Enthusiastic

"I know that," said Willys. "We have no secrets from each other."

Willys has returned from a long series of conferences with Willys-Overland dealers and distributors, in which he filled them with enthusiasm about the future. He started out again immediately, and the hours in between had been filled with conferences, but he was full of fight, aggressiveness and confidence.

Both men fairly radiated confidence in their companies. Business is coming rapidly and the future is full of promise.

"This trip of Mr. Willys' out among the dealers has been wonderful," said Chrysler. "The whole situation has been turned directly about. The dealers are full of confidence and enthusiasm. We're selling cars and we're building them, but we're not making any more than we're selling, and we're not going to. I made that statement months ago and it stands. It wouldn't be good business."

Willys spoke delightedly of his conferences with dealers and distributors in Chicago, Omaha, Kansas City, Oklahoma City, Dallas, St. Louis, Minneapolis, Charlotte, N. C., and Atlanta. He will hold similar conferences at Indianapolis and Toledo.

"I've shown the boys," Willys said, "that I'm not dead and that the company

is not going broke. I've nailed a lot of misstatements that have been going around and have tried to clarify the situation. I've just given them facts and the response has been wonderful. After each of these conferences the distributors have been busy booking orders, although we didn't ask for any business. I've invited bankers to come to these meetings, and I feel certain they understand a lot of things that they didn't before."

On the subject of the refinancing program for Willys-Overland and the Willys Corporation, the "chief" was somewhat reticent.

"If I talked about it," he said, "a wrong impression might get out. Everything is running along smoothly."

Ruggles, Once Republic Head, Organizes Truck Company

Saginaw, Mich., April 28—Following the completion of the organization and the election of officers announcement was made here today of the formation of the new Ruggles Motor Truck Co. of this city with a capitalization of \$2,000,000 to manufacture a light truck and a 2-ton truck which will be followed ultimately by a complete line of trucks.

Frank W. Ruggles, former president and general manager of the Republic Motor Truck Co., Alma, Mich., is president of the company. Mr. Ruggles is recognized as a leader in the motor truck industry. Under his guidance the Republic company grew to be the largest motor truck manufacturers in the world. The new company has ample financial backing and with Mr. Ruggles' truck manufacturing knowledge and experience the new Saginaw enterprise looms as a new giant in the truck field.

Production on the new models will start immediately and the first truck models, it is expected, will be ready for showing in July.

The officers of the company are Frank W. Ruggles, president; W. J. Wickes, vice-president; Ezra L. Smith, secretary; Walter C. Hill, treasurer; Charles T. Kerry, assistant treasurer and John F. O'Keefe, counsel. They compose the board of directors together with Benton Hanchett, Julius B. Kirby, H. T. Robinson, Otto L. Dittmar, John J. Thorne and Harry H. Price.

RECEIVER TO SELL TRUCKS

Philadelphia, April 22—On petition of Clinton E. Woods, receiver for the Bethlehem Motors Corporation, asking instructions from the court, Judge Thompson, in United States District Court of the eastern district of Pennsylvania, has issued a decree granting the receiver authority to sell the completed trucks on hand and in the field, amounting to some three hundred and thirty-six vehicles at the Allentown, Pa., plant of the company and elsewhere, at private sale at prices he deems desirable; and also to sell under similar circumstances such excess inventory at the Allentown and the Pottstown plants not necessary for the maintenance of the service station.

Increased Tax on Passenger Cars Is Pennsylvania Plan

Proposed Prohibitory Tax on Motor Trucks in State Believed to Be Adjusted

HARRISBURG, April 29—Objections made by motor truck interests in the state and such organizations as the Philadelphia Chamber of Commerce apparently have caused the State Highway Department to agree to several important changes in the Buckman bill seeking to regulate motor traffic which the department hitherto has been supporting.

Following conferences between George Biles, deputy highway commissioner, and motor truck representatives agreements were reached when the bill came up for hearing before the Senate committee having it in charge. These agreements include:

Reducing the proposed increases with respect to trucks and raising the fees for passenger cars from 40 to 50 cents per horsepower. It is understood that present truck fees will, however, be raised about one-half their present rate—it had been planned virtually to double them—with a larger percentage for heavier trucks with solid tires. The original increase contemplated was all the way from 80 per cent to 200 per cent in truck registration fees.

George M. MacFarland, Harrisburg, representing the Pennsylvania Motor Dealers' Association and the National Automobile Dealers' Association, was among those objecting to a large increase in truck fees. He urged that as many men out of work are trying to make a living by buying second-hand trucks and using them for carrying trade, the license fees would prove a hardship, as they would cost more than the original payment on a truck, purchased on the time-payment plan.

USED MAILS TO DEFRAUD

Davenport, Iowa, April 29—Thomas McCluskey was sentenced to a year in Ft. Leavenworth after he pleaded guilty to a charge of using the mails to defraud. McCloskey was former manager of the Akron Tires Sales Co. and of the former Continental Auto Supply Co. of this city. He is alleged to have inserted advertisements which guaranteed their advertisers, announcing prices below the market on standard automobile accessories. He was distributing substitutes, it was claimed.

DEALERS HELP OTTAWA CLUB

Ottawa, Ont., April 29—During the latter part of April more than 150 members have been added to the roll of the Ottawa Hunt and Motor Club. A great membership drive started on April 19 in which the automobile dealers were assisting the Motor Board by soliciting owners. Membership carries with it membership in the Ontario Motor League.

Weight and Horsepower Basis for New Fees in Rhode Island

State Will Obtain Great Additional Revenue Through Passage of Motor Vehicle Bill

PROVIDENCE, R. I., April 29—In an effort to establish greater equity in fees levied on motor vehicles the Rhode Island General Assembly has passed a bill providing for registration rates based on horsepower and weight which will take effect on July 1. This is the only legislation that was passed during the assembly session. An entire recodification of the state's motor vehicle law introduced late in the session was killed and a dozen other measures, including among them a bill to establish complete reciprocity to non-residents and two anti-theft measures, also failed to pass.

The new measure relating to fees conforms with the uniform fee schedule recommended by several national automobile bodies. It provides that passenger cars and trucks shall be assessed 25 cents per horsepower and 25 cents per hundred pounds of gross weight, if equipped with pneumatic tires. If vehicles are equipped with solid rubber tires the weight rate is 35 cents per hundred, and 50 cents per hundred pounds is assessed upon motor vehicles with metal tires.

Trailers are assessed 15 cents, 25 cents and 35 cents per hundred pounds, depending upon whether they are equipped with pneumatic, solid rubber or metal tires.

Dealers will be charged \$10 per car, with a minimum of \$30 to be required. The present rate is \$5 dollars a car with minimum charge of \$25.

The N. A. C. C. formula—square of bore multiplied by number of cylinders, divided by 2.5—will be used to compute horsepower. This formula has been used by the Rhode Island automobile department for the past 12 years.

The weight to be computed upon passenger cars will be the actual weight of car plus 150 pounds for each passenger seat; for commercial cars the actual weight of the vehicle plus manufacturer's rated load carrying capacity.

Rhode Island's old fee schedule which has been used for the past five years, provides for levying the fee according to horsepower, the passenger cars being divided into four classes—up to 15 horsepower, \$5; 15 to 30 hp., \$10; 30 to 40 hp., \$15; over 40 hp., \$25. Trucks have also been grouped and taxed on capacity and horsepower.

Additional revenue to the state under the new bill will amount to 30 per cent on passenger cars and 200 per cent on trucks, it is declared. Not all of the car types will find that the fee has increased under the law, but practically every motor truck will find a jump of a substantial amount in the new rate.

VACUUM CUTS OIL PRICES

New York, April 23—The Vacuum Oil Co. has announced a substantial reduc-

tion in the prices of Gargoyle Mobiloils of all grades and in all size packages. The reductions range from \$5 to \$10 a barrel and from 10 cents to 30 cents a gallon in cans. The company reduced its prices as of April 20 to give its dealers who had price guarantees to May 1 on carload or other large quantities, protection against loss covering the unsold portion of such shipments remaining on hand. A refund will be made to all such customers of the net difference between the prices at which the oils were originally invoiced and the new prices.

Four Year Scholarship for Best Road Essay

WASHINGTON, April 29—The highway transport education committee headed by Dr. P. P. Claxton, United States Commissioner of Education, has announced the regulations for the national highway transport essay contest which is open to all pupils of high school grade. The prize is a four year scholarship offered by H. S. Firestone in the university or college designated by the successful contestant. Essays must not be more than 500 words in length and must be in the hands of local committees not later than June 15. The subject will be "goods roads and highway transport." The contest was held last year for the first time and the winner was Miss Katherine F. Butterfield of Weiser, Idaho. She was presented with a certificate of scholarship by President Harding.

SALESMEN DINE PRESIDENT

Philadelphia, April 29—The Automobile Salesmen's Association of Philadelphia gave a farewell-testimonial dinner to "Bill" Hawkins, retiring president of the organization. As a mark of esteem a Shrine emblem was presented to him. Albert Russ succeeds Mr. Hawkins as president. Other officers are as follows: David Romm, vice-president; John Rivele, secretary; David James, treasurer and Fred DeWitt, financial secretary. Mr. Hawkins goes to New York.

FORM NATIONAL RACING BODY

Philadelphia, April 29—The National Motor Racing Association, an enlargement of the Philadelphia Motor Racing Association, has been incorporated under the laws of Delaware and will stage races throughout the middle Atlantic states during the season of 1921. The association now includes automobile, motorcycle, airplane, drivers and motor boats, etc. The new officers are: T. J. Sweeney, president; W. J. Strickler, vice-president; R. J. Maginn, secretary and John Williams, treasurer.

Oregon Has Much of Previous Road Appropriation on Hand

Thirty-five Counties Have Bonded Themselves to Extent of \$15,363,704

PORTLAND, April 29—The 35 counties of the state of Oregon have bonded themselves to the extent of \$15,363,704 for road improvement since the advent of the automobile, practically all of the money being voted within the last three years, and considerably more than half of it still remaining unspent, according to a summary made public this week by the state highway commission. This is in addition to the state road money and the federal aid money which has been provided along with county funds.

Under the Oregon system the state highway department stands ready to aid the various counties by putting up half the cost for improvement of the main highways. This liberal program has resulted in activity in the various counties, both in meeting the state funds for improvement of main highways and for secondary roads connecting with the main highways.

The money obtained from county bond issues, which has been spent thus far, has gone, together with state funds, into improvement of three important state roads, the Pacific highway running through the state north and south and connecting the state with California the Columbia river highway, the great east and west road, and the Old Oregon Trail, which connects with the Lincoln highway from the east.

Oregon is to have a second main highway into California, according to action of the state highway department in permanently establishing the location for The Dalles-California highway.

Location of the first 100 miles of this road, from The Dalles south, was made by the highway commission last week, and it is estimated that \$1,500,000 will be required to grade the road and surface it with gravel. Work will start in 1922 and it will take several years to complete the road.

SAXON DISTRIBUTOR DIES

Chicago, April 29—C. H. Graham, president of the Graham Motor Co., distributor for the Saxon Motor Car Corp., died at his home here. Previous to organizing the Graham Motor Co. two years ago, Mr. Graham was associated with the Rue Motor Car Co., and prior to his entrance into the automobile field was a successful business man.

SOFIELD FORMS NEW COMPANY

Philadelphia, April 23—After a retirement of nine months, Hilton W. Sofield, formerly vice-president and general manager of the Keystone Truck Co. of this city and the builder and designer of the Keystone truck, has re-entered the automotive field with the incorporation of the Penn Motors Corp. which will manufacture popular size trucks.

Market Analysis Is One Factor in Successful Truck Business

Association Told That Practical Uses More Important to Prospect Than Mechanical Features

PHILADELPHIA, April 29—Members of the Motor Truck Association of Philadelphia at their April meeting at the Hotel Adelphia to the number of 250 heard R. E. Chamberlain, assistant general manager of the Packard Motor Car Co., discuss "What an Ideal Dealer should Be."

After reviewing causes and conditions of the business hesitancy, Mr. Chamberlain said that the truck industry had been hit harder than the passenger car business, but that both were fundamentally sound. As to merchandising trucks, Mr. Chamberlain advocated (a) market analysis; (b) study of the possibilities of territory and (c) the instruction of salesmen that it is better to be able to meet a customer's arguments about the practical use of the truck in his business, than to be able to talk mechanical features.

"Sound merchandising and a sound financial basis provide the safeguards for the dealer's profits," he declared.

He told of methods used by the Packard company which gave the factory an index of where distributors were lax. On the subject of trade-in, the speaker said it marks largely the measure of a dealer's ability to succeed, but he thought the used car department ought at least to break even. He emphasized the importance of good service. He said that in the last analysis the antidote for all business troubles was work.

J. D. Eggleston, motor transportation engineer of the Paige Motor Car Co., in speaking on the subject of "Analyzing Motor Transportation" illustrated by charts and figures how dealers could find and suggest a market for prospective truck users who should be told how and where trucks could be made profitable to them.

George M. Graham, vice-president of the Pierce-Arrow Motor Car Co., told of an interview with President Harding in which the president had expressed deep interest in the problem of the overtaxed industry and showed that he was an ally of the industry and will be kept so.

Michigan Pikes Convoy to Bear Message of Good Roads

Detroit, April 29—Active preparations for its sixth annual tour are being made by the Michigan Pike Association. The tour will start the second week in July and will be called the "Around Lake Superior Tour." It will cover 1,700 miles in fifteen and one-half days.

Plans call for the use of 80 motor cars and trucks to accommodate at least 350 persons. As the big convoy passes through the country it will provide an object lesson in motor transportation to every community on the road. The truck

section of the convey which serves as the auxiliary of the motor car section will mount on separate vehicles electric lighting equipment, fire prevention apparatus and ambulance service.

The encouragement of good roads sentiment and creating through touring routes which are the real objects of each of the Michigan Pikes Association's annual jaunts will be more emphatic in the plans for the 1921 tour. As in previous years every point on the route is to be the scene of a good roads rally.

Taxes Before Commerce Body

Concluded from page 21

cial problems at all compared with those of the other nations which took part in the war. The public debt of Great Britain is almost half its national wealth and the proportion is even greater in France, Italy and Germany. In this country, however, the national debt is only \$25,000,000,000 and the national wealth is \$250,000,000,000.

Although Good was the only outspoken advocate of higher taxes on automobiles, there were other men of equal prominence just as steadfastly opposed to the sales tax. They asserted it would not be fair to the great mass of the people to impose taxes on the purchase of food, clothing and other vital necessities.

Meyer S. Rothschild, leading exponent of the sales tax, answered this argument, however, by the assertion that taxes always are passed on to the ultimate consumer and that with conditions as they are now 22 cents of every dollar the consumer spends go for taxes while with a sales tax this proportion would diminish to 3 cents.

The most important action taken by the delegates in relation to the tariff was adoption of a resolution recommending that permanent tariff legislation should provide for the creation of a Tariff Adjustment Board to be appointed by the President with such emolument and tenure of office as would remove the members from political influence and personal interest. The present Tariff Commission would report to the new board.

It would be the duty of this commission to fix just and reasonable rates to meet changing conditions, thereby giving American industries reasonable protection from destructive foreign competition while maintaining and encouraging export trade.

MICHIGAN GAS TAX KILLED

Detroit, April 29—Automotive executives heard with satisfaction that the bill of Representative Atwood imposing a tax of one cent a gallon on gasoline and other volatile fluids had been killed in the committee of the whole at Lansing. The measure had the backing of the bridges and highways committees as a means of raising funds for highway improvement. It was rushed through in record time and for a time seemed certain of passage. Opposition lined up in great numbers when it came before the committee of the whole.

Head of Sacramento Dealers Says Buyers' Strike Is Ended

Business in All Lines Back to Pre-War Levels in California City and Country-wide

SACRAMENTO, April 29—The long buying strike of the motoring public is at an end, declares J. K. Flynn, president of the Sacramento Motor Car Dealers' Association, who says that business is back to pre-war levels as regards volume, although prices have not returned to their former status, of course.

"The whole thing is country-wide and not because of local conditions," says Flynn. "The buyers struck, the manufacturer had to quit producing, men were thrown out of work, railroads stopped their manufacturing departments, and the strike, started by the worker and the salaried man, came back upon him with redoubled force. The people have seen it, and they have started buying, not only automobiles, but all kinds of articles they need."

Certain it is that the automobile district in Sacramento is a much more hopeful and prosperous place than six months ago. There are those buyers, of course, who still are waiting for further declines in prices, but they will wait whatever prices may be reached.

Right now is the big selling season in California. It is true that the touring season here always is open, but spring is spring wherever it may be, and the call of the open road in California is as strong as anywhere. After a winter on the pavements, numerous as they may be, there is the longing for the mountain highways, and the advent of this season brings buyers here as elsewhere.

Show Proves Great Stimulant to Dallas Automobile Trade

Dallas, Texas, April 29—Automobile dealers of Dallas are selling cars as a result of the first spring automobile show held here. Not only are they actually selling and delivering cars in numbers which surprise them but they have some of the liveliest prospects in months.

Tire and accessory dealers are also reporting increased business. Because of the general betterment of trade the first and second weeks after the show the Dallas dealers are of the opinion that the show should be an annual spring affair and that it should be held downtown. They favor a permanent show building and are working on plans to get it. The dealers say that the exhibits put them in touch with customers and prospects they had not thought of.

MAY PROSPECTS BETTER

Toledo, April 29—The Electric Auto-Lite Co. announces that business prospects for May are 20 per cent better than for April. As a consequence the company is gradually taking on additional employees and now has approximately 750 on the payroll.

Buys Up American Made Parts in France for Shipment Here

Will Be Brought in and Sold at Lower Prices Unless Congress Acts

(By cable to MOTOR AGE.)

PARIS, April 25—The first American reconstruction camp at Verneuil, the largest motor transport organization in France, has been sold for 55,000,000 francs (\$11,000,000 normal exchange rates) to a private company with government interest in the profits.

The camp contains few automobiles but an immense stock of parts including 9,000 boxes of Ford parts and 45,000 solid tires.

It is intended to sell the parts on commercial lines and a large part of them will be reimported into the United States.

Paris, April 16—Two more American automobile camps are being offered for sale as a whole. They are the camp at Bassens near Bordeaux, and remains of the Franchises camp, near Langres, in the Haute Marne. Individual sales have been carried on for some time at both these camps, but it has now been decided to clear out the material as a single lot. The Bassens camp contains 223 Holt tractors, 87 F. W. D. tractors and trucks, 208 5-ton Liberty trucks, 38 White trucks of various types, 52 Riker 4-ton trucks, about 30 Packards, and small numbers of Nash, Pierce-Arrow, G. M. C., Republic, Garford, and Mack trucks. In addition there are some passenger cars and a certain quantity of various chassis.

At the Franchises camp, near Langres, there are 85 Liberty trucks and about \$2,000,000 worth of American automobile spare parts.

NO BUICK PRICE REVISION

Flint, April 29—The current number of the Buick Bulletin contains a page editorial written by E. T. Strong, general sales manager, which asserts that no revision in the prices of 1921 Buick

models is warranted and that no possibility is seen of a price revision during the life of the present selling agreements with the trade. This announcement, it is said, is based entirely on manufacturing conditions as they exist today and are likely to continue to exist during the current season. It is asserted that there has been practically no reduction in the cost of manufacturing Buick cars and that no reduction could be made without danger of jeopardizing quality and service.

Saxon Motor Car Co. Disposes of Its Parts Service Rights

Detroit, April 28—Through a deal consummated with the Saxon Service Corp. the Saxon Motor Car Co. relinquishes its parts service rights on all Saxon cars now running up to the time when the Saxon Duplex was put on the market more than a year ago in consideration of \$550,000. From this it will pay \$400,000 of \$500,000 bank indebtedness and \$85,000 due merchandise creditors, using the balance as working capital.

This deal will permit the Saxon company to start production of its new model with the Gray engine immediately. President C. A. Pfeffer said today that production on the new models is not expected to reach capacity output of 100 daily for some time. The Saxon service corporation is controlled by Maurice Rothchild of Chicago.

RECEIVER FOR WILCOX TRUCK

Minneapolis, April 29—Frank E. Satterlee, president and manager of the F. E. Satterlee Co., has been appointed by Judge W. F. Booth as receiver for the H. E. Wilcox Motor Co. The petition for the appointment of a receiver was filed by the Standard Foundry Co. with a claim of \$9,545.08. The receiver was instructed to operate the repair department of the Wilcox factory to give service for 2000 Wilcox truck owners in the twin cities. The company agreed to the receivership and admitted the claim of the Satterlee company.

Dodge Denies Rumors of Shut Down Price Cut and New Model

Branded by Officials as Malicious Effort to Interfere With Company's Business

DETROIT, April 29—Persistent rumors to the effect that Dodge Brothers would announce a price reduction of \$300 May 1, were set at rest by C. W. Matheson, general sales manager, who declared the Dodge prices would not come down until manufacturing cost was reduced, and added that the cost of production today is greater than it ever has been. Mr. Matheson's statement followed a lengthy conference between President Haynes and officers and directors of Dodge Brothers, and a telegram was prepared to be sent to the Dodge dealer organization denying the rumor and denouncing it as a malicious effort on the part of competitors to interfere with Dodge business.

Another report that the Dodge factory would be closed down also was denied, and it was stated that the plant now is turning out 450 cars a day and selling cars more rapidly than they can be turned out. Still another report that Dodge would put out a new sedan May 1 and which a Dodge official said probably gave rise to the price cut rumor, inasmuch as factory executives were urging dealers into a spirited sales contest in the effort to dispose of the old model before the new one went on the market, also was denied.

The reports on Dodge have been heard in financial circles for several days and have been carried by news bureaus and ticker service. It also was said in these reports that the company was meeting with much sales resistance and on account of the backward market on cars was contemplating either a price cut or a shut down.

"You can say there will be no price reduction now and none in the future insofar as we can see," said Matheson.

They Met to Plan Michigan Dealers' Association



Plans for the Michigan Dealers' Association were formulated at a preliminary conference of delegates held at the Hotel Statler in Detroit. The cities represented and the accredited delegates were: Flint, G. L. Simmons, D. W. Marshall, Edward Lunt; Saginaw, G. S. Garber, Alex. Levinsohn, J. J. Thompkins, Robert Bishop; Lansing, Dwight Robson, Charles Gower, M. L. Garlock, Edward Phelps; Grand Rapids, W. L. Peiter, Fred Kramer, C. E. Northrup; Benton Harbor and St. Joseph, B. F. Wells; Jackson, Guy Butler, Gilbert Loomis, W. B. Dunn; Muskegon, C. A. Witt, H. L. Gwatkins, F. E. Hathaway; Battle Creek, C. L. Meade, James Woodward, C. E. Zang; Kalamazoo, R. E. Fair; Port Huron, Earl Page, John Cawood; Washtenaw County Association, Walter Staebler; Detroit, W. J. Bemb, H. R. Graham, G. O. Simons, H. H. Shuart; Bay City, M. H. Oviatt, Fred Terrell. The N. A. D. A. was represented by Harry G. Moock, general manager and P. F. Drury, assistant manager.

Durant Chooses Cleveland as His Production Center

Collins Who Joins Him Succeeded by Rice as President of Cadillac Company

CLEVELAND, April 28—News that William C. Durant will stage a comeback to the automotive industry with Cleveland as his main production and operating center electrified motor financial and business circles in this city. The announcement that R. H. Collins, president and general manager of the Cadillac Motor Car Co. of Detroit, has resigned to head a new company known as the Durant-Collins Motor Co. with an initial investment of \$5,000,000 gave this city its first news that another big automobile production organization will be established here.

Collins and a staff of engineers are due to arrive in this city in two weeks. They will be established at the plant of the Standard Equipment Co., Loraine avenue and West One Hundred and Sixth street, where the preliminary engineering works for the production of the car to sell at popular prices will be commenced. The task of providing plant facilities for production on a big scale will go ahead and there will be no delay in the construction of a new plant and equipment.

The bulk of the fund required will be put up by Durant, Collins and their associates but it is stated that \$1,000,000 of the original capital will be offered to Cleveland investors. There are rumors that the Durant effort will not be confined to this one company. It is said that there are existing motor companies and parts enterprises here that fit nicely into the Durant plans and which may be taken over and developed as subsidiaries of the eastern company, organized recently as Durant Motors, Inc., which is a holding company for the various Durant producing concerns.

Detroit, April 28—H. H. Rice, former treasurer of General Motors Corp., has been made the president of the Cadillac Motor Car Co. to succeed R. H. Collins, according to the official announcement issued by General Motors corporation today. Both Mr. Collins and Mr. Rice are now in New York and no further statement could be secured regarding plans for the Cadillac company.

Hoover Calls on Industry in Reorganizing His Department

Washington, April 29—Three representatives of the automotive industry have been invited to assist Secretary of Commerce Hoover in the reorganization of the Department of Commerce along lines that will make it useful to industry in the development of foreign and domestic trade. Thirty-six business leaders will meet here this week for conferences and business paper editors will gather on Monday for the second of the monthly meetings with Mr. Hoover.

J. Walter Drake, chairman of the Foreign Trade Committee of the National Automobile Chamber of Commerce; John J. Raskob, chairman, finance committee, General Motors Corp., and W. H. Stackhouse, president, National Implement & Vehicle Association will discuss the problems of the automotive and allied industries. It is proposed to change the personnel of the conferees in order to keep in touch with special men in all industries as the problems relating their particular field arise.

PRACTICAL TIRE MERCHANDISING AND REPAIRING

(Concluded from page 13.)

customers can stop their cars conveniently. Do not choose a store on a street that is so narrow that parked cars are constantly in danger of being sideswiped and where those who must do service work on the tires are in danger of being run down by passing vehicles.

In several cases where store locations have otherwise been ideal, landlords occupying adjacent stores or quarters above the stores have objected very strenuously to cars being parked in front because it apparently interfered with the landlord's interests. Be sure there is no fire-hydrant in front of the store, and thus avoid the necessity of constantly warning customers not to park too near it.

If possible, choose a store where signs can be used to the greatest advantage (Fig. 6). Advertising signs that hang over the sidewalk are excellent. They help in attracting transient trade and to impress your location upon those residents of your own town who have not yet become your regular customers.

IS YOUR STORE CLEAN?

Now a word to those who already have established locations. Remember, always, that cleanliness is next to a credit balance on the ledger. The public shuns dirt; and it also shuns sloppy business methods. Are your floors and windows clean, shelves dusted, merchandise neatly stocked? Or are customers passing by your store because it is dirty, dingy and ill-kept?

Wake up! Look around you at the modern dry-goods houses, drug-stores, hardware stores, etc., all bright and clean and up-to-date places of business. That is one way these places attract and hold their trade. Clean stock, well arranged, invites the customer inside.

How many times has your wife said in passing the business place of a townsman, "What a nice clean store." How many other men's wives say as much of yours? How much better than to say "What an awful hole to work in." Yet many vulcanizers work in "an awful hole."

There is no excuse for dirt. It is easy to be clean. If you knew that by setting your alarm clock 10 minutes earlier mornings and using that 10 minutes with a broom in the store would bring you one more customer a day, would you set the alarm clock ahead? You would. Try it for one week.

(Next Week—Makes of Tires to Handle)

Hannum Succeeds Warner as President of Oakland Motors

Retiring Executive Says Company Plans No Reorganization or Readjustment of Sales Policy

DETROIT, April 29—Formal announcement of the resignation of Fred M. Warner, president and general manager of the Oakland motor car division of the General Motors Corp., has been made by Mr. Warner, who said he would remain as vice president and a director of the parent corporation. Just when the resignation, which has been accepted, becomes effective has not been announced, nor would Mr. Warner say what active duties he would take up for the future.

In making the announcement of his resignation, Mr. Warner said his successor would be George H. Hannum, who for some time has been president and general manager of the Saginaw Products Co., a General Motors subsidiary. Mr. Hannum went to Saginaw in 1912 as shop superintendent of the Wilcox Engineering Co., one of the first industries taken over by General Motors in Saginaw. Prior to that connection he was with the Detroit Lubricator Co. Mr. Hannum is widely known in the automotive field and is prominent in civic affairs in his home city.

Warner has been president of the Oakland division for several years, having joined General Motors after long service in the implement manufacturing industry.

Mr. Warner took occasion to deny a report coming from Indianapolis that there was to be a reorganization of the Oakland Motor Car Co. and a readjustment of sales policy. The report, he said, probably resulted from the fact that Oakland distribution in Indiana in the future will be handled by a private company rather than through the Oakland branch.

With reference to a statement that the former owners of the Oakland had regained control he said the company was owned and controlled by General Motors Corp. and denounced the report as an absurd rumor.

GREATER HAYNES PRODUCTION

Kokomo, Ind., April 29—A. G. Seiberling, general manager of the Haynes Automobile Co., has issued a statement in which he says the company is producing 33 1/3 per cent more cars than ever before in its history and employing approximately 16 per cent more men. In many departments day and night shifts are being operated.

NASH TO EXPAND

Kenosha, Wis., April 28—At the quarterly meeting of the directors of the Nash Motors Co., here here it was announced that the company planned to build an addition to its plant in Milwaukee. The addition will be 100 by 600 feet and three stories high, and will be large enough to provide for a large increase in the output.

Industry's Business for April Shows Advance Over March

Month Brings Large Number of Releases on Old Orders, Parts Makers Report

NEW YORK, April 29—Business in the automotive industry which began to forge ahead in January will show an improvement this month over last. The increase over March will not be so great, however, as it was in March compared with February. May remains something of a problem. Orders already on hand make it certain trade next month will approximate that for April but whether it will continue to increase remains in doubt. There is a pronounced feeling that progress from now on will be slower than it has been for the past quarter.

Conditions in the industry were discussed at a group credit meeting of the Motor & Accessory Manufacturers' Association here and the experiences of the members showed a remarkable similarity.

Bills Paid More Promptly

The outstanding fact expressed is that collections are better than they have been since late last summer. Notes given last August are being paid and notes made more recently are being met, in most instances, upon the due dates. Cash has again made its appearance. Credit conditions are much easier than they have been in months. Collections showed considerable improvement last month but the gain in April has been much more pronounced. Nearly every member showed gratification over the way in which notes and bills are being paid.

In general there has been a decided improvement among the parts manufacturer in the amount of new business, the number of releases on old orders and in collections. Individual experiences differed somewhat but the trend was all in the same direction. Additional passenger car companies are constantly coming into the market for supplies. The pulse of the truck end of the industry has begun to stir and some business is coming from the makers of commercial vehicles.

Parts and accessory manufacturers who depend on jobbers and retailers for a substantial share of their business, reported that this trade is remarkably good and that it is now on virtually a normal basis. Orders are substantial and payments prompt. Jobbers and dealers seem to be doing a greater volume of business in proportion to the capital invested than the manufacturers of complete vehicles.

April has brought a very large number of releases on old orders and they have come from virtually all the passenger car companies, small as well as large. This indicates that the business recovery has filtered through the entire industry. Some of the companies mentioned were

Haynes, Jordan, Grant, Hupp, Briscoe, Peerless, Stutz, Lincoln, Rolls-Royce, Cadillac, Kissel, Dodge, Oakland, Barley, Maibohm and Studebaker.

Ford and Franklin seem to be leading in the list of companies offering new business. Others mentioned in this class included Chevrolet, Oakland, Wills-Lee, Lincoln, Chandler, Mercer, Hudson, Dodge and Hare's motors.

Truck companies which have come into the market include International, Rugles, Brockway and Acme.

Buying Only as Needed

Complaint was general that passenger car companies are ordering on a strictly hand to mouth basis and that they expect deliveries before it is humanly possible to make them. Stock chasers have again taken the field. Parts makers have little idea of the future requirements of their customers and it is difficult for them to keep stocks of materials on hand for this reason. It was felt that forecasts of the probable amount of business for the next few months would be difficult and that general stabilization of prices would do much to restore business to normal conditions.

One particularly gratifying statement in regard to collections was that they have showed marked improvement in the south where they have been almost hopeless for months.

Certificate of Ownership Needed Under Michigan Law

Detroit, April 29—Passage of the Condon Bill, which was signed last week by Governor Groesbeck and which will become effective 90 days after adjournment of the legislature, is expected to put a decided check in automobile thefts in Michigan. Under the terms of the bill every car in the state must be registered with the secretary of state who will issue to the owner a certificate of title. All used car dealers must be licensed at a cost of \$5 and will be required to have a certificate for every car they handle.

An investigating bureau will be established with the income derived from licenses for investigating violations and for the employment of state inspectors to carry on the work. Heavy penalties are provided for violations of the terms of the law including a maximum prison term of ten years and a fine of \$50 or both. A fine of \$100 is provided for any individual operating a car after July 1, 1922, without having a certificate of ownership in his possession.

OLD TIMERS' CLUB GROWING

New York, April 29—Directors of the Old Timers' Club at a meeting here decided to encourage the formation of sections in various parts of the country. The membership is rapidly increasing and the directors decided to promote annual reunions at the national shows and through local sections at other shows. The membership will be brought together for discussion of automobile projects which it will be fitting for the organization to support.

Postponements in Proposed Goodyear Refinancing Plan

Banking Interests Express Satisfaction With Company's Sales Policies and Organization

AKRON, April 29—Postponements of the special meeting of Goodyear Tire & Rubber Co. stockholders, called to approve the refinancing program, follow in rapid succession. The latest ones were from Monday until Wednesday and from Wednesday until next Monday.

President Seiberling and Vice President Seiberling have returned from New York where they spent several days in consultation with the bankers. F. A. Seiberling has declined to comment in any way on the passing of the company's control from his hands into those of the bankers. While it has been announced in New York that the Seiberlings will be ousted it is hoped here that no such drastic step will be taken and that the new control will be more supervisory than active. The banking interests are expected to designate at least one vice-president for the company as well as the treasurer to prevent a repetition of what they regard as reckless expenditures which was considered largely responsible for the present plight of the company.

Bonds Allow Twenty Years

Akron bankers and rubber manufacturing experts, after a careful study of the refinancing program, have expressed the opinion that the company will be able easily to work out of its present financial position during the 20 years allowed by the life of the bonds. The increased capital charges added by the bonds, and prior preference stock if the total amount of bonds required remains at \$85,000,000 together with sinking fund charges, will approximate nearly \$14,000,000.

Goodyear records show that the company's net earnings since 1913, up until last year, amounted to a total of \$70,067,490, out of sales aggregating \$576,109,108. The net earnings for the three years previous to 1920, were larger than during other years. In 1917 net earnings for the first time exceeded \$10,000,000 and were about \$14,000,000. In 1918 the earnings increased to \$15,000,000 and rose to \$23,000,000 in 1919.

Goodyear did a total business of over \$200,000,000 last year, but due to contractual obligations and writing down of inventories, reported a deficit instead of a profit. The company is now working on a basis of 20,000 tires daily, as compared to normal production of 23,000 tires a day, and at this rate will do a business this year of more than \$140,000,000.

Goodyear's sales in 1919 were \$169,000,000 and for the first six months of 1920, reached \$104,000,000 having reached the figure of nearly \$1,000,000 a day when the slump came in the tire industry. It is expected that Goodyear sales for the ensuing fiscal year, will approximate \$140,000,000 and perhaps exceed this.

Louisiana Plan of Taxation Held as Menace to Industry

Constitution Makers Reject Dealers' Proposition for General Participa- tion in Levy

NEW ORLEANS, April 29—Automobile distributors, dealers and owners throughout the state of Louisiana are confronted by an extremely serious situation and one which will curtail seriously the sales of passenger cars in this state, if it is allowed to develop along lines on which it is now moving. This is the projected writing into the new constitution, now being framed at a convention at Baton Rouge, of a tax law which will compel every automobile owner to pay \$20 annually for his license, instead of the \$10 he now pays; also pay two ad valorem taxes of 5 mills each, one to the state and one to the parish, annually, on every dollar of value in his car; and, furthermore, pay a tax of 2 cents a gallon on every drop of gasoline he uses.

According to the new ordinance, which is known as the "Blackman plan" because it was introduced by John C. Blackman, an agricultural delegate from Caddo parish, the income to the state will be as follows:

One-half of one mill general property tax	\$ 200,000
License tax of \$20 annually on every car in the state.....	1,500,000
Five mills state and five mills parish ad valorem tax on 75,000 automobiles, with an average assessment of \$300 each	225,000
Gasoline tax, two cents a gallon on an average of four gallons every day for every car in the state.....	2,190,000

Total per year taken from the automotive industry of Louisiana\$4,115,000

This tax, which, from all indications, and in the belief of virtually all the automobile dealers of the city, is now on the way to adoption as a part of the organic law of the state, came up as a substitute method of raising some \$28,000,000 to \$35,000,000 for the construction and maintenance of a state-wide system of good roads. The automobile men had no opposition to the good roads plan; in fact they were for it, and, when Gov. John M. Parker requested the automobile distributors and dealers of the state, as well as the motorists, to aid in the making of the new constitution, they joined with P. M. Milner, president of the Louisiana Motor League, in drawing up a plan whereby the necessary money was to be raised by a bond issue, running for some 30 years, to be paid by a small general tax.

No sooner was this Milner plan, backed by virtually all the dealers and motorists of the state, presented to the constitutional convention, however, than the delegates rejected it, and proceeded

to try to put the entire burden of the construction and maintenance of the roads for the whole state on the automobile distributors, dealers, and, most directly, on the owners. The automobile interests and the automobile owners, with the motor league, believe that the farmers, fruit-growers, merchants and others who get the great ultimate benefit from good roads, should pay their fair share for the building and perpetuation of these roads. The dealers and owners were willing to come in for their share, through the present license tax, and through a reasonable per capita tax on cars owned in the state, in which the dealer with cars in stock, the used-car dealer and the motorist would participate. But to bear the entire burden was a little more than the dealers or the owners had bargained for.

Philadelphia, April 29—The Philadelphia Automobile Trade Association, at a luncheon at its headquarters, presided over by President Louis C. Block, heard G. H. Moyer, deputy auditor general of Pennsylvania, talk on how legislative bodies operate, including the passage of laws.

Distributors May Appear at Washington in Tax Hearings

Washington, April 29—The request of the National Automobile Dealers' Association for a formal hearing on the revenue bill has been granted by the Senate committee on finance. Dates for the hearing are yet to be announced. The Senate committee intends to take up a number of general revenue propositions in connection with the new fiscal program and then to proceed to the direct question of taxes and discuss the revenue law of 1918 section by section under the general titles of the former act.

C. A. Vane, general counsel of the association, is now studying the tax situation and will make a report to the directors of the N. A. D. A. at the meeting in Detroit May 9. At that time the directors will determine whether the executive committee of the association will appear before the Senate committee, whether the entire board will go or whether a number of the leading distributors of the country will be asked to present the tax case from the dealer's standpoint.



Reading left to right—O. Bruenauer, administrative department of the Southern Motor Mfg. Assn., Ltd., Houston, Texas; Jacques E. Blevins, president, Southern Motors; David Beecroft, the Class Journal Co., president S. A. E.; Dave D. Cahn, vice-president Southern Motors; H. L. Robertson, retiring president of the Texas Automotive Dealers' Association

Stresses Value of Fixed Price System in Address to Dealers

Houston, Texas, April 28—David Beecroft, president of the Society of Automotive Engineers and directing editor of the Class Journal publications, was tendered a luncheon here by the Houston Auto Trade Association at which he was introduced to the distributors and dealers by Jacques E. Blevins, president of the Southern Motors Mfg. Association, Ltd.

Mr. Beecroft spoke of the general situation throughout the country as it affects the automobile industry and told of what the S. A. E. had done and is doing for the industry.

During his remarks he touched on the necessity of reducing the cost of car maintenance to make it easier to sell a new car and stressed the point of the

fixed price system of doing repair work which enables car owners to know in advance what the cost of repairs will be. This system, he said, has produced excellent results in places where it has been installed, satisfying both the owner and the repairman.

Salesmanship, especially as it pertains to motor trucks, he said, is an art that should be studied more closely this year and emphasized that every motor truck should be sold to the job and sold on an engineering basis. He added that the time was not far distant when house lighting systems and tractors would be among the activities of the automobile dealers and urged the dealer to departmentize his business. He also spoke of the need of better roads.

Concerning Men You Know

H. A. Wagner, formerly general manager of the Reliance Motor Truck Co., Appleton, Wis., has resigned from that concern but has not yet announced his future plans, although it is expected that he will continue in the motor truck industry with which he has been so long identified.

R. L. De Voe has been appointed general sales manager of the Dawson Mfg. Co., Chicago, makers of the self-aligning grease cup. The company is now in its new factory at 2012 Larrabee street.

The Continental Car Co. of America, Louisville, Ky., manufacturer of Continental truck bodies for Fords, has added \$600,000 to its capital which now gives the company \$1,000,000 working capital. The increase is to be used to provide extensive improvements to its plants. Irving Miller has been elected secretary of the company.

Walter C. Martin, formerly Cadillac dealer in New York city, has been appointed general sales manager of the Continental Car Co. of America, Louisville, Ky., builder of Ford truck bodies. George W. Copp heads the George W. Copp Co., distributor of the company in greater New York.

H. C. Alderson, active in automobile circles in Spokane since 1908 and for years with the Blackwell Motor Co., and Wolf H. Duncomb, formerly accessory salesman for that company, have organized the Bearings & Rim Supply Co. to engage in business in Spokane.

Frank D. Stoop, pioneer automobile man of Kalispell, Mont., has sold his automobile garage business to Leon B. Allen, formerly of Minneapolis.

C. W. Clever, Indianapolis, has been named Indiana agent for the Portage Tire & Rubber Co.

Robert H. Campbell has resigned as vice president of the Comet Automobile Co. of Decatur, Ill., to become vice president and production manager of the Farmers Mfg. Co. which has taken over the business of the Coleman Tractor Co. of Kansas City. The new corporation intends to continue production of the Coleman tractor which will be redesigned. Officers of the company in addition to Campbell are: president and general manager, Frank Hamilton, vice president O. M. King, secretary and treasurer, James E. Dunn.

H. H. Crawford has been placed in charge of the branch of the Motor Wheel Corp. of Lansing, which has been opened in Detroit. The branch will supply Michigan and Ohio.

Louis Wolf, prominently identified with the business interests of Putnam, Mass., for more than a decade and known as one of the most representative automotive dealers in that part of New England, will move to Springfield, Mass., early in the fall where he will acquire a 20 per cent interest in a \$500,000 automobile sales concern in which New York and Springfield men are to be interested.

Howard K. Ford has resigned as manager of the Hastings Mfg. Co. of Hastings, Mich., to accept a similar position with the Winter Stamping Co. of Goshen, Ind., manufacturer of a replacement glass curtain light for Ford cars and a complete line of glass curtain lights for all makes of cars.

J. B. Sopher has joined the division sales managers force of the Selden Truck Corp. and has been assigned western Pennsylvania, eastern Ohio and the Ohio valley with some additional territory, with headquarters at Pittsburgh.

W. H. Schmelzel, former president of the W. H. Schmelzel Co., St. Paul, has formed the Wills Ste. Claire Co. of Minnesota to distribute that car in Minnesota, Montana, the Dakotas, parts of Wisconsin, Iowa and Nebraska. W. S. Williams is secretary; John Finch of Cleveland, salesmanager; and O. R. Munger, service manager.

E. D. Shearman, Jamestown, N. Y., one of the organizers of the Salisbury Wheel & Axle Co. and its general manager up to the time it was sold to eastern interests in 1919, has been elected a director and secretary of the Collier Motor Truck Co. of Bellevue, Ohio.

J. T. Clinton has been appointed manager of the passenger transportation department of the Packard Motor Car Co. of Philadelphia. He will have charge of the distribution of Packard motor cars throughout the entire territory covered by the Philadelphia office, embracing eastern Pennsylvania, southern New Jersey and Delaware. Mr. Clinton was formerly manager of car dealers' sales for the Goodyear Tire & Rubber Co., at Akron.

A. C. Rowland has been appointed salesmanager for the Penn-American Motor Car Co., Philadelphia. He will handle both wholesale and retail distribution.

dency of the United States Light & Heat Corp., will take active charge of that plant at Niagara Falls. Mr. Kelly formerly was with Mr. Miniger at the Toledo plant.

TRY TO SAVE SINCLAIR MOTORS

New Orleans, April 28—The 1,400 stockholders of the Sinclair Motors Co., now in the hands of a receiver, are working to raise \$100,000 by subscription to reorganize the company and save it from forced sale at auction to satisfy the demands of the directors. The company holds patents on a new valve-in-head engine for automobiles and boats.

JOEL CHANDLER HARRIS, DEALER

Atlanta, April 29—With \$15,000 capital Harris-Hamilton, Inc., has been organized and incorporated here by Lucien Harris, Joel Chandler Harris, III, and Louis Hamilton, all of whom are prominent business men of the city. The company will operate a dealer and distributing agency.

DUTIES ON IMPORTS \$786,628

Washington, April 29—Duties on imported automotive products during the calendar year of 1920 amounted to \$786,628.75, according to the statistical report completed this week by the Bureau of Foreign and Domestic Commerce. It is

particularly important at this time because of the pending fight on tariff matters. The report shows that 30 per cent tax levied on 811 automobiles valued at less than \$2,000 each, amounted to \$197,992.50. Forty-five per cent assessed on 93 cars valued at \$2,000 or over, brought \$133,842.60 into the Federal Treasury. The same rate applying on 380 imported bodies amounted to \$36,628 in duties. With the 30 per cent rate of duty applying on 240 chassis, \$256,546.80 was yielded, and on other finished parts, not including tires, \$71,499.30.

Atlanta Dealers Decide on Show as Yearly Spring Event

Atlanta, April 29—The Atlanta automobile show will hereafter be an annual spring event. This decision was reached at a meeting of the Atlanta Automobile Dealers' Association, under whose auspices the show was held. Plans for next year's event were discussed and work is to start in the near future toward making the 1922 show even bigger and better than the 1921 show. The action of the dealers in this regard was unanimous, every dealer present at the meeting expressing the belief that the show not only stimulated interest but resulted in the closing of many sales during the time it was in progress and the remainder of the month after it had closed, many of which would not otherwise have been made until later in the spring.

Another Government Auction to Sell 3000 Motor Vehicles

Louisville, Ky., April 27—Sale at auction of more than 3000 motor vehicles, including 2700 trailer chassis that have never been used, will take place at the Government Depot at Jeffersonville beginning tomorrow morning. The sale will be in charge of M. Fox & Sons Co., which has conducted all motor auctions for the government.

The sale will consist of 119 Dodges, twenty-nine White trucks, eleven GMC ambulances, 138 Liberty three-ton trucks, twenty F. W. D. trucks, two Mack trucks, 180 Harley-Davidson motorcycles and Indians with side cars, and 2700 new trailer chassis.

SPEAKS ON STATION SAFETY

Columbus, April 29—T. P. Kearns, Ohio inspector of workshops and factories, was the principal speaker at the regular weekly meeting of the Columbus Automobile Trade Association. He talked on "Garages and Garage Stations," treating them as to their construction relative to safety.

READER WISHES MAP

Mr. W. H. Meinholz, 3728 N. 25th street, St. Louis, Missouri, requests a copy of the map of America's Motor Highway, published in the April 5th, 1917 issue of MOTOR AGE. Will those who have and find it convenient to spare this map communicate with the above party? Thanks.

Larger Quarters Secured by Chicago Jordan Distributor

Chicago, April 29—The four story building at the corner of Michigan avenue and Twenty-fifth street, which is the heart of automobile row, now occupied by the Maxwell Sales Co., has been leased for a period of twenty-five years by the Chicago Motor Car Co., Jordan distributor. O. G. Hefflinger is president and Edwin Bluthardt, secretary and treasurer of the latter company. The new lease begins Dec. 1, 1924 and the term rental is reported to be \$500,000. The Chicago Motor Car Co. formerly occupied a three story building with a twenty-five foot frontage on the avenue, moving last October to a building with double the frontage. The property occupied by the Maxwell company is triple the frontage originally held by the Jordan distributor.

MINIGER STILL WITH AUTO-LITE

Detroit, April 29—An announcement of the election of C. O. Miniger as president of the United States Light & Heat Corp. has given rise to the belief that Mr. Miniger had resigned as president of the Electric Auto-Lite Corp. On the contrary, Mr. Miniger retains his position at the head of the Auto-Lite, and D. H. Kelly, who has accepted the vice-presi-

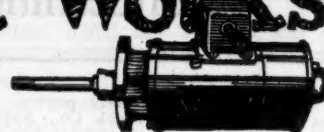
How the Electric System Works



Article IV

By A. H. PACKER

Instructor, Ambu Engineering Institute.



A Short Series of Articles Wherein Is Given the Fundamentals Underlying the Operation of the Modern Electric System as Applied to Automotive Apparatus

THE water flew from under the wheels, the road still wet from a heavy spring shower, as I drove along toward the little town where I hoped to put up for the night. Here the road was hard gravel, but back a ways, the little flivver had nearly died in low getting through some of the mud holes.

Now the road led down a gentle slope, then around a curve and up the hill again. Just as I neared the crest, the engine started to race, and the car came to a sickening stop. I tried low gear, then reverse, then high, with the same result; the engine ran but the car was dead. Just ahead a farm house showed among the trees, and there I went in search of help.

The men folks were out in the field somewhere, but I used their 'phone, and called up my old friend Bill Fixit at the next town. Bill promised to send his truck right away so I went back to the car and waited. Half an hour passed, three quarters and just as I began to wonder what had happened, I saw Bill's truck swing around the bend ahead of me, and who should be driving it but the very same red headed lad that I figured Bill had fired only the week before.

"Hello," I said, as he came within ear shot, "Thought Bill had chased you out of town, or out of the shop at least."

"Well," said the red-head, "He sure was sore about my burning his meter up, but I told him I would pay for it, and he said that if instead of doing that I would save up my coin, and take a course in automobile electricity it would be all right with him and I would be worth ten bucks more a week when I got through."

"I was sure glad to hang on to my job and told Bill I would ask you about the right school to go to, as Bill said that

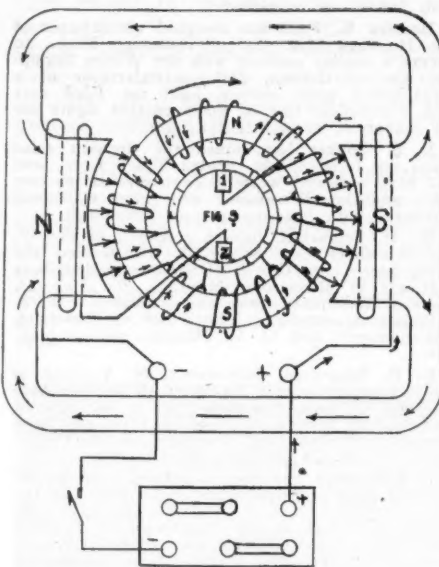


Fig. 3—Here is illustrated the path of the current and magnetism in a ring wound armature

at most of them you just sat and listened to the instructor and mostly forgot everything he said, and at some of them you had a lot of junk to play with but didn't know what it all meant, but he said you taught at one of them where they not only told you how, but gave you real stuff to work on and then showed you how besides, so that you really could get something out of the work."

"Well, son," I said, "I'll be glad to tell you about that, but let's pick up the front end of my bus with that crane of

yours, and get her in to town before it gets dark."

As we drove along, I told the red-head about the electrical articles that had been published in MOTOR AGE for the past three weeks, and told him to get these old copies from Bill and read them over that night. "If you do that," I said, "I will help you a bit tomorrow, and give you some sketches and instructions, and from time to time as I drop in on your burg, I will see how you are getting along, and if you get a general idea of the subject, you will be better prepared to get 100 per cent out of your course when you have the money to take it."

The lad said he would sure do as I told him, and when I left him at Bill's shop, he beat it for home with the three copies of MOTOR AGE under his arm.

The next morning when I got to Bill's shop, I found the red head there ahead of me. "Say," he began as I entered, "I sure had the dope all wrong. Funny how a feller will go along, thinking he knows it all, and all the time he's kiddin' himself. I sure got straightened out on volts and amperes and I think I know the difference between a voltmeter and an ammeter, even if I can't put it all in figures, like it is in the articles."

Bill winked at me and said, "That's the beginning of a good man when he finds out it is possible to learn something and begins to lose a little of his conceit." I nodded and spoke to the lad. "Suppose we talk it over a while, and see what our next step will be." The last article showed how a meter works, and as motors work on the same general principle, we will figure them for a while.

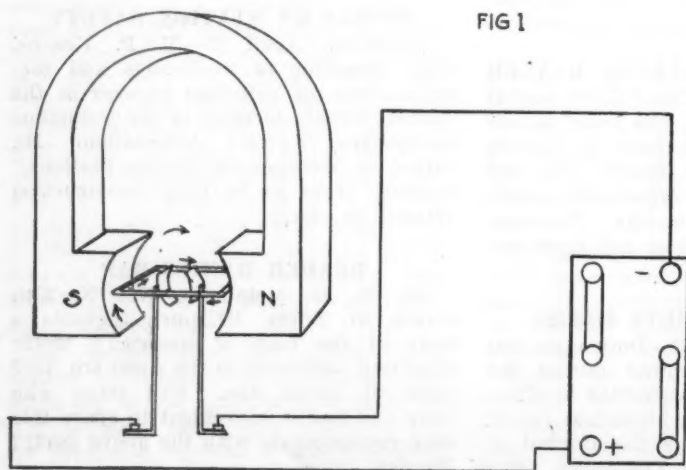


FIG 1

FIG. 2.

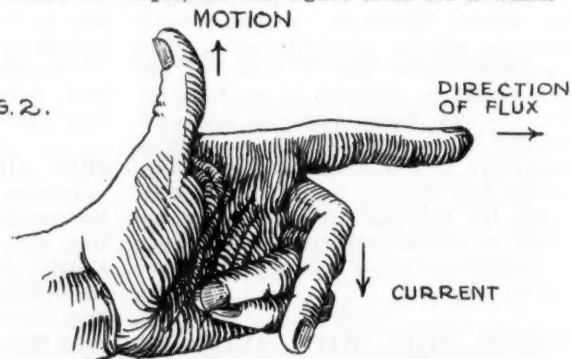


Fig. 1—Left—Diagram illustrating passage of current through a conductor of an armature. The attraction and repulsion of the unlike and like poles causes the rotative member to revolve

Fig. 2—Above—The left hand rule for determining the direction of motion when the direction of the flow of the flux is known and the direction of the current flow. Any two of these will, of course, determine the third

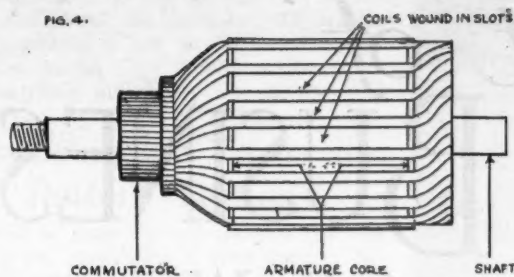
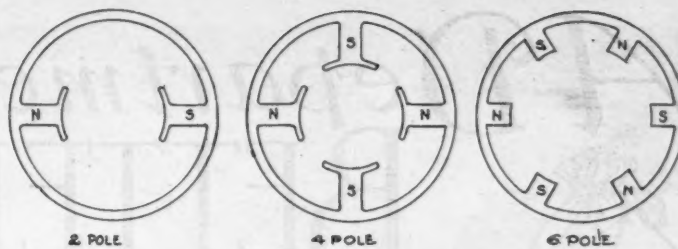


Fig. 4—This is a conventional drum wound type armature, having the coils wound in slots in the surface of the armature

In Fig. 1 is indicated a horseshoe magnet with a coil in between the pole shoes, and we will assume that it is pivoted and free to rotate. In working on the meters we considered the effect of magnetism on a wire carrying a current, and found that the wire tried to move across the magnetic field. In order to easily remember the direction in which a wire tries to move, we can refer to a rule called the "Left Hand Rule" which is used for motors. The way to use this rule is shown in Fig. 2, the thumb and first two fingers of the left hand being extended in three different directions, at right angles to each other. If the fore finger is now pointed in the direction of the flux or magnetic lines of force, in other words from North to the South pole, and the other finger is pointed in the direction in which current flows in the wire, the thumb will then point in the direction that the wire tries to move by reason of the magnetic effect on the wire carrying the current. Using this rule of Fig. 2 on the sketch shown in Fig. 1, we will begin by considering the right hand pole north and the left one south. We will then connect up the battery as shown and indicate by arrows the direction in which the electrical current flows along the wire. If you now hold your left hand with the fore finger pointing from N to S and the other finger pointing with the current you will find that the left side of the coil in the magnetic field tends to move up and the right side tends to move down, which would, of course, give a rotary action to the coil.

If now we had the positive side of battery permanently connected to one side of the coil and the negative to the other, the coil would just move until it was in a vertical position, and there would then be no more tendency to rotate. In order to get continuous rotation, it is, therefore, necessary to employ what is commonly known as a commutator, a simple form of this being shown in the sketch. This commutator is made of the semi-circular pieces of copper, to which the ends of the coil are fastened, and on which two strips of brass rub in order to connect the coil to the battery. If we now give the coil a start, it will turn due to the rotary action of the coil, and as the wires get to a position where the rotary action stops, the motion of the commutator segments under the brushes, or copper strips, will cause the connections to the coil to be reversed, which will make the coil continue to rotate.



STARTING MOTOR FRAMES

FIG. 5

Fig. 5—Various types of motor and generator frames having two, four and six poles. It will be noted that the poles alternate regardless of the number

This simple coil would not, of course, be a commercial proposition as it has a dead center point, when the coil is in a vertical position, and in this position would also appear to put a short circuit on the battery, but the general idea is the same as used in the ordinary starting motor except that more wires and more segments are employed.

We will now consider a number of improvements that are necessary to change the basic idea shown in Fig. 1 into a practical starting motor.

First, we will consider the things that

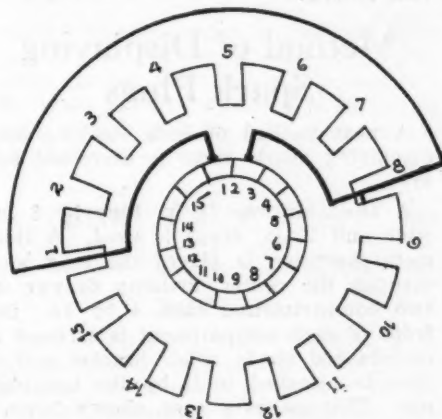


Fig. 6—A winding is either lap or wave wound. This one is a lap winding, so called because coils lap back on each other. The ends of the coils of a lap wound armature always come back to a segment near the starting point for the other end of the coil

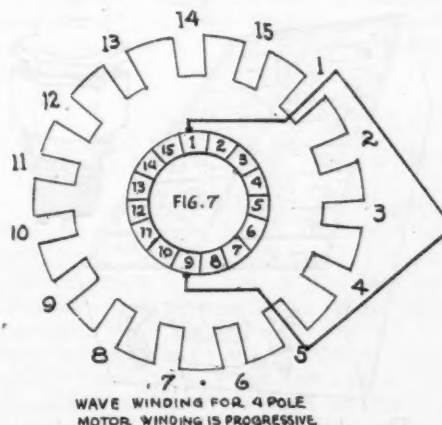


Fig. 7—This is a wave winding. In this type of winding the coils are so wound that they proceed around the armature in wide spans

produced the torque or turning effort, and we find this is due to the current in the coil and the strength of the magnetic field, and as there is a very wide air space in between the north and south poles, it is very hard for the magnet to send many lines of force. We can, therefore, improve the field strength by winding our coil on an iron core, which we will call our armature core, and we will allow this core to turn in between the poles of the magnet with just enough clearance so that it does not rub.

Second, we will figure on a way to make the magnet as strong as possible, and to do this we find it would be better to use an electro magnet made of soft iron instead of a permanent one of steel, as the molecules in the soft iron are more free and the soft iron can, therefore, be more highly magnetized.

The third thing to consider is the number of coils or wires that are affected by the magnetism, and we find that the more wires we can put on the armature, the more torque or turning effects we will have, for each one does its bit. This addition of coils will also increase the number of commutator segments and give smoother running, and eliminate the possibility of the motor having a dead center position.

Referring now to Fig. 3, we have a motor that incorporates the improvements we have been discussing, the armature being of the ring type, which we will use at present for purposes of illustration, although it has been displaced by the drum type, to a great extent. The nature of the drum type will be discussed later. The motor consists of an outer frame of soft iron, having two poles, "N" and "S" which project inward toward the armature. The armature is the ring shaped piece of iron on which the winding is located. The commutator is shown as an inner ring of segments, each segment a connection to a part of the winding, and against this commutator, two brushes rub, these being marked "1" and "2."

In tracing the path of the current flowing from battery we start at the positive terminal, and go to the field coil on the "S" pole, around the pole and then to the brush marked "1." Tracing through the armature winding there are two paths to brush "2," that is to the right or to the left, so that the current divides, half going one way and half the other, and reunite at brush "2." It then

(Continued on page 46.)

A Department of BETTER BUSINESS



A dollar will be paid for all ideas accepted as Better Business—Perhaps you have some.

Conducted by Ray W. Sherman

"Trial Balance" of Your Sales Possibilities

Are you, perhaps, failing to cash in on some sales possibilities which are right at your hand? It is a good thing for the dealer every now and then to summarize his sales and exploitation possibilities in black and white. Such a summarization might read like this in part:

Advertising Slants:

New Purchasers.

Past and present performance of cars sold by me.

Services we render.

What purchasers say about our cars.

Why people who have been driving other cars bought our cars this year.

Sales Possibilities:

All former patrons.

At least five new people to be seen each day by each of my salesmen and by myself.

All friends and relatives of folks who are driving cars purchased from us.

A summary of this sort if prepared intelligently and honestly most certainly would open the eyes of almost any dealer to new and almost unthought of chances for business. There's nothing like getting a black and white "trial balance" of business possibilities like this.

Invite Families When You Give Demonstrations

Every week-end during the summer time should offer the alert dealer a splendid chance for getting in close touch with a number of real prospects. This might be done by inserting an advertisement like the following in the local newspapers during the early part of the week:

"TO TEN PEOPLE WHO SHOULD AND WHO COULD OWN A CAR:

"We'll give you a regular for-sure demonstration this week if you'll get in touch with us.

"We'll take you in our ——— demonstration cars on a hundred and fifty mile trip, or to the lakes or wherever you want to go.

"This will be the sort of a demonstration that you'll enjoy and that will show

you what a splendid car the ——— is. It won't be any half hour drive around the city or anything like that.

"AND WE WANT YOU TO TAKE YOUR FAMILIES ALONG.

"Also there will be no obligation on your part to purchase a car from us. If you don't buy a car, all well and good, we'll be good friends anyhow.

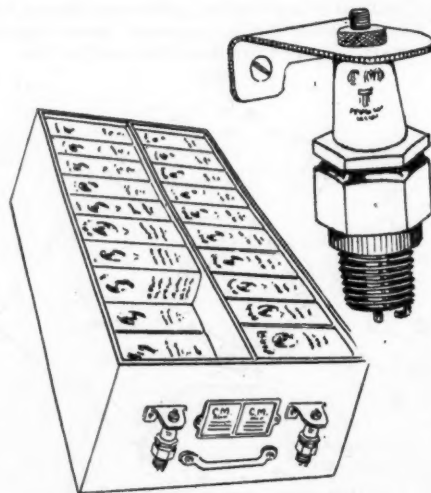
"Get in touch with us at once—only ten people can be accommodated this week-end."

An offer of this sort ought to get some real results.

Method of Displaying Spark Plugs

A neat method of both stocking and displaying spark plugs is described below.

A stock drawer (4 in. high by 8 in. wide and 12 in. deep) is used. A thin metal partition is placed the long way through the center, dividing drawer in two compartments, each 4 by 12. On front of each compartment is screwed a curtain rod shade roller bracket and a plug is attached to it by the terminal nut. This makes a neat, showy display and as the compartment holds about three dozen average plugs in paper containers, the stock condition is continually apparent. Auto Sales Co., Remington, Ind.



The above shows how spark plugs may be stocked and displayed advantageously by brackets placed on the front of stock drawer

Rewards Most Careful Woman Driver

Availing himself of the opportunity to obtain advertising through a contest which is being conducted by a Des Moines newspaper, Mort Zucker, manager of the Stewart Products Service Station, that city, has offered to each woman, who is awarded one of the three cash prizes by the newspaper for being the most careful driver during the day, three additional prizes, among them being a bumper and a searchlight. Inasmuch as the newspaper makes a front page feature of the contest which it is sponsoring, the company gets a little front page advertising every day which naturally proves a valuable means of getting business.

Sells the Farmers All Kinds of Oil

Many dealers make a thorough canvass of their territory each spring in an effort to sell the farmers a season's supply of automobile and tractor oil. An Iowa dealer added to his list machine oil, cream separator oil, hog oiler oil, harness oil and did as much business with his additional lines as he did with his old standbys. Why not make a complete job of it while you are on the job?

Use the Forge and Clean Up the Junk

Many old axles and drive shafts are used as crowbars and various similar purposes. By pointing up old shafts very good tools can be had. A dealer has his men do such work in spare time on the forge and in this way cleans up the junk. He also has staple pullers made from short pieces of shafting. Another way to convert some waste material and a few minutes into salable products.

He Cashes in on Old Radiators

The edges of most radiators wear out while the center of the core is in serviceable condition. One radiator repairman uses the center of large radiators that are beyond repair in the original size to make smaller radiators or special radiators from. Also a radiator from an out of the ordinary car can be

used by fitting up the core for a smaller job. Radiators are easy to buy at the junk yards at a low figure and this repairman keeps busy during spare time in rebuilding old jobs.

Drive Around Today for Battery Testing

The L. E. Reed Service Garage, Charles city, Iowa, maintains a free battery inspection service for two reasons: 1st—It enables the firm to get acquainted with the automobile owners; 2nd—It gives the firm a chance to demonstrate its ability to care for and repair batteries. The firm considers this as one of their best advertising ideas. By availing themselves of this inspection of their batteries the automobile owners are kept from trouble on the road and are also helped to get longer life from their batteries. The firm runs a long ad in the newspaper in regard to this service and ends with the slogan "Drive around today!"

Sell Wiring Equipment to Save Car Owners Trouble

Neglect to have their cars rewired until they are caused considerable trouble characterizes many car owners. One dealer placed an oil soaked and worn set of wires in the window by the side of a new set. A card just back of the display read "IF YOUR WIRING LOOKS LIKE THESE YOU WILL BE CALLING FOR US SOME DARK NIGHT. LET US REWIRE YOUR CAR NOW AND SAVE YOU THE TROUBLE AND EXPENSE." This display and the concentrated efforts of the organization brought in business and reduced the wire stock to a very reasonable size.

The Country Club As An Asset in Selling

The alert dealer or salesman should, by all means, join the local Country Club or golf club and play golf or tennis with the folks who patronize the club. Practically every person who belongs to an organization of this sort not only owns a car but buys a new car every year. And, quite frequently, the male members of the club are in the market for cars for their wives. If the dealer gets on real friendly terms with the members of the club it is a cinch that he will get the bulk of their car business, and that would mean a lot to any dealer or salesman.

Rents the Power Light Plant He Handles

Many dealers who are selling farm lighting plants have a plant mounted in a car so it can be demonstrated at the customer's home. One dealer has worked up a nice bunch of rental business for his demonstrator plant. It is used at outdoor dances, open air church, picnics, country schoolhouses, and a



Outrivaling Nature with Salesroom Settings

"Call of the Road Week" in Los Angeles brought out some remarkable salesroom displays by the dealers. The above shows what can be done in reproducing an outdoor scene, calculated to awaken man's love of the great outdoors and to impress him with the value of the motor car to carry him to its furthestmost beauty spots. The setting of this display was unusual. Through the use of a back drop, the road ahead was made to appear as continuing up the mountain grade

number of other places. Not only does he get good pay for the use of the machine and his time, but he demonstrates the plant to large numbers of people at such places and the advertising costs him nothing.

Arrows Point Way to Home of Prompt Service

The owner of a garage in a small town in the middle west has a novel means of directing automobile owners to his place of business. When business was a little slack he manufactured a number of tin arrows and printed on them the number of blocks or miles to his—The Star—garage. He then went through the town and into the country on the main roads leading to his garage and placed the arrows at the proper distances. He also placed at other intervals along the road some of the arrows upon which was printed: "When in need of prompt service call the Star Garage, _____, Phone No. _____."—F. J. Joslin, Independence, Ia.

Here Is a Sign for Your Salesrooms

"The Motor Car Has Become an Indispensable Instrument in Our Political, Social and Industrial Life."—President Warren G. Harding to Congress, April 12, 1921.

Why not put these words on a sign and hang the sign up in your salesrooms in so conspicuous a place that all your prospects can see it. And why not put the words on your stationery?

The sentiment was spoken by President Harding upon the occasion of his first address to Congress since his inauguration and is official recognition of the essentiality of the motor car.

His Demonstrator Carries His Card

George H. Williams, Manchester, Conn., representative of Hudson and Essex, uses a tire carrier cover on the rear of his demonstrator which reads, "George H. Williams Sells Hudson and Essex Cars in Manchester."

Friday for Advertising Week End Trips

On every Friday during the summer time the dealer should use some sort of advertising which would make every non-car owner wish that he did own an automobile. Such advertising might take the form of telling how the owners of cars purchased from the dealer are going to spend the week end. Some of the items contained in such an advertisement might read like this:

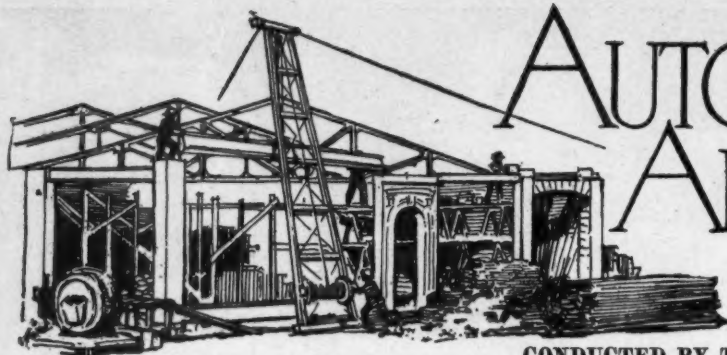
"I'm going to drive the family to our cottage at Clear Lake," said D. L. Jones, "and spend Sunday fishing. Believe me, there's nothing like having a

Whizzer for getting joy out of life?"

"Homer R. Hartman is going to take a week-end trip to South Bend and back. The family will drive to South Bend Saturday and spend the night there and return home Sunday. Without a Whizzer car they couldn't get this pleasure."

Each item should, of course, emphasize the car which the dealer sells.

Such advertising would be pretty sure to arouse a lot of interest and make some of the readers come around to the dealer to find out how they could secure a car.



AUTOMOTIVE ARCHITECTURE

Planning and Building Problems

CONDUCTED BY TOM WILDER



Lime and Its Use in the Service Building

LIME was probably the first prepared building material used by the ancients with the possible exception of brick or burned clay. Both materials were equally easy of discovery, a good brisk fire being all that is needed in their preparation. Geographical location was the principal factor determining which would be discovered first. In a limestone country the chances of discovering the use of burned and slacked lime in the building of stone walled huts are quite good, while in a clay country the discovery and use of burned clay blocks would be more probable and they could be cemented together with clay mortar into a fairly permanent wall.

Lime is of many grades and qualities depending on the quality of the stone from which it is made, but the most desirable is obtained from comparatively pure limestone. In the process of burning the limestone which is more or less pure carbonate of lime, carbonic acid gas is driven off at the high temperature to which the limestone is heated, leaving only the lime oxide or ordinary quick lime. This quick lime has a great affinity for water and when water is applied it absorbs a large amount and gives off a great quantity of heat at the same time, melting from a lumpy consistency to a pure white creamy mass which is the hydroxide of lime with an excess of water.

This creamy paste is now just right to be mixed with sand to form lime mortar. It can also be dried and pulverized, sacked and sold as hydrated lime. Where slacked lime is wanted in small quantities, it is usually bought in the hydrated form but if used in the construction of a building, this would be too expensive and is bought in the barrel instead. It is put into a shallow box and spread out 2 to 4 in. deep and enough water added to just about cover it. As the chemical action proceeds, it must be watched to see that it does not dry out in spots and "burn."

This is prevented by stirring in these spots with a hoe. After all boiling has ceased, sand may be added immediately if the mortar is to be used for brick work, but if for plaster, the paste is usually strained through a $\frac{1}{4}$ -in. wire sieve and all the hard unslacked lumps removed.

NOTE—From time to time it will be the purpose of this department to publish descriptions of the various building materials and processes employed in garage and service building construction. If any readers wish to ask questions along this line they will be cheerfully answered where possible.

Automotive Architecture

IN this department MOTOR AGE aims to assist its readers in their problems of planning, building and equipping, service stations, garages, dealers' establishments, shops, filling stations, and in fact any buildings necessary to automotive activity.

When making requests for assistance please see that we have all the data necessary to an intelligent handling of the job. Among other things we need such information as follows:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated, and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.

For plaster, the mortar should be piled up after the sand is added and allowed to age for one or two weeks. If used immediately, the small unslacked lumps, some of them no larger than a pin head, will dry out and remain dormant for some time. Then, when damp weather comes they will absorb moisture and finish their slacking with the result that a chip of the plastered surface immediately over the lump will be cracked off. These eruptions are called "poppers" and are usually to be seen where buildings are put up in a great hurry. Lime plaster and mortar hardens with age. As it absorbs carbonic acid gas from the atmosphere, it goes back to its original form of carbonate of lime. This process is sometimes hastened by burning coke in salamanders while the plaster is still wet. The salamanders give off car-

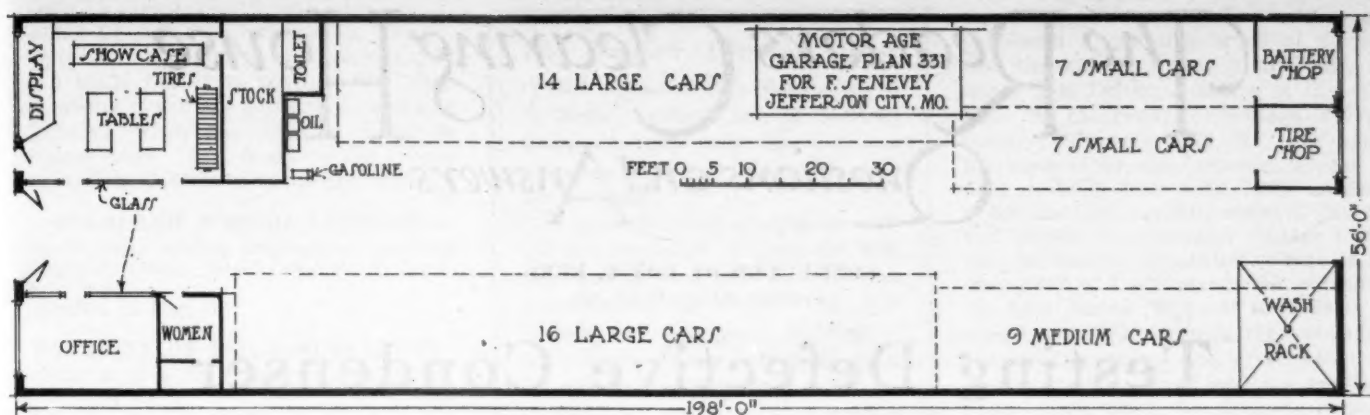
bonic acid gas which the moist plaster absorbs immediately. Too rapid drying delays hardening as the moist plaster will absorb gas much more rapidly than dry.

Brick, known as sand lime brick, is made from lime and sand. These bricks are first formed by dry hydraulic pressure and then subjected to high pressure steam, enclosed in suitable tanks. Here the hardening depends on the development of lime silicates. Another form of lime which is coming into extensive use in late years and which threatens to eliminate hydrated lime entirely because of its convenience, is calcined gypsum. Gypsum is sulphate of lime and the calcining process which is at a very low temperature, merely drives off the water of crystallization leaving what is known commercially as plaster of paris; so called because it has been made for centuries from the gypsum deposits underlying the city of Paris.

Sets Rapidly

Plain plaster of paris sets in a few minutes after the addition of water which would be altogether too quick for wall plaster. Consequently, manufacturers have made additions of various materials called retarders and marketed their product under various trade names, some of them all ready for use and others requiring the addition of sand. Sand being rather heavy, and consequently expensive to ship, it is cheaper to use an unmixed brand in a district where good sand is plentiful.

Gypsum plasters have the advantage of assuming their permanent hardness except for drying out, within an hour after being applied. They are never used as mortar for laying stone or brick probably because they would harden before they could be used and if kept soft by mixing too long much of their hardening ability is lost. It is a quality of cement and gypsum mixtures which harden by crystallization with water, that if, after crystallization starts, the crystals are muddled up by remixing, the strength of this initial set will be lost. If the mixing is kept up long enough or until all chemical and crystallizing action has ceased, there will be no strength to the plaster whatever; it will dry as a crumpled mass.



Garage for Storage Purposes Only with Center Aisle

The battery, tire shop and washrack are placed in rear corners on the first floor instead of the basement as desired by the reader because of better light facilities

No. 331

GARAGE FOR STORAGE ONLY

I am planning to construct a one story garage on a lot 198 ft. by 56 ft. This lot extends to a wide, paved alley in the rear. I believe the first 35 or 40 ft. of this building would supply ample room for an office, storeroom for accessories, showroom and toilet. The balance of the structure will be devoted to storage space. A basement would accommodate a battery and tire repairroom but I do not plan on having the repairshop in the building. Would the entrance be better placed in the center of the building or at the corner?—F. Senevey, Jefferson, Mo.

Evidently you do not plan to handle cars and if so a center entrance somewhat as shown, would be most satisfactory, but if cars are to be sold and a showroom is necessary the whole front should be kept together with the entrance along the side wall.

Unless you have unusual facilities for getting light into the basement we would recommend that the battery and tire shops be located at the rear of the first floor where they will get ample light either from the windows or overhead.

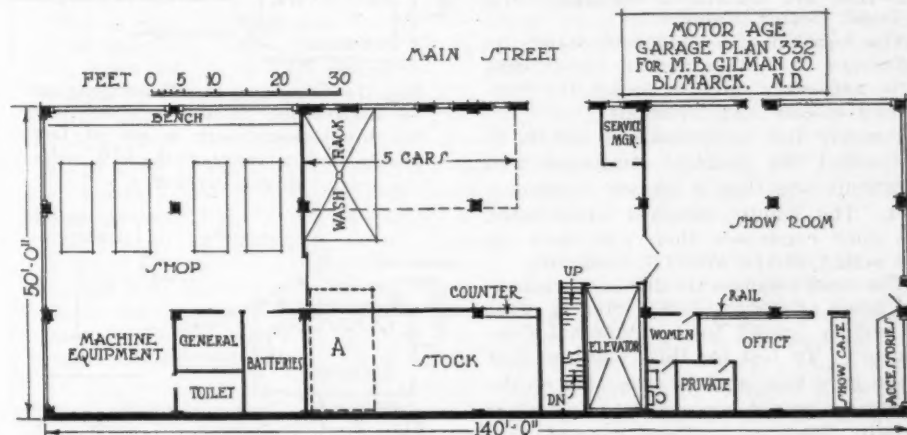
If you can extend the basement under the sidewalk and put sidewalk lights in the cement walk overhead you can get enough light for a good shop. Otherwise, there is no chance unless your building happens to be on a side hill so that the floor is above grade at some point.

Your roof should preferably be trussed for a storage garage, but if you use posts, space them in a row about 12 to 14 ft. from the wall and just far enough apart so that either two or three cars may be parked between 13 ft. or 14 ft. 6 in. clear space between posts is about right.

No. 332

EXCLUSIVE DODGE SALES AND SERVICE BUILDING

We would like suggestions for an exclusive sales and service building for Dodge Brothers cars. Our lot is on a corner, 50 ft. by 140 ft. It is our intention to use the entire basement for storage of such new cars as we may accumulate during the winter. We plan to put in only the one floor at present, but want to so lay out and construct this that later we can add another story or possibly two. The sales floor should accommodate about five cars and the parts room should oc-



Sales and Service Plan for Dodge Brothers Agency

The chief difficulty in this plan was to arrange for elevator space. If other floors are added to this building the best place for it would be on the alley side in center

cupy at least 600 sq. ft. Entrance to the salesroom should be in the corner of the building. A small space is needed for service on generators and the battery department can be small, as we service only Dodge cars. Our shop will employ from four to seven men. As we will only handle accessories pertaining to Dodge Brothers cars, this department will be small and storage will be of secondary consideration.—M. B. Gilman Co., Bismarck, N. Dak.

Arranging a permanent place for an elevator is your greatest difficulty. The best place for it now is as shown on our plan, but after the other floors are built it would perhaps be better on the alley side in the center, as then cars leaving upper floors or the basement would not have to turn. With the elevator as we have it or at A, which position might be preferred since it would allow enlarging the showroom when more floors are added, an open space will have to be maintained on each floor in front of it in order that cars may make turns upon entering and leaving.

You could save much in remodeling expense and get a better balanced building if you could add your second story immediately. It might be worth while, however, to determine the difference in cost when taking bids of building two stories above ground and of building basement and first floor. Unless there

is a very great difference we would prefer the former, as the basement is of no use except for car storage, while the second floor would house all the departments intended for the first floor and leave half of it vacant for new car storage. The overflow could be handled by a public warehouse if there is any.

MOON PRODUCING 18 DAILY

THE Moon car has undergone some slight changes, chiefly minor refinements. The frame depth has been increased 1½ inches to give more rigidity. The size of the shackles has been increased and the silico-manganese springs have been redesigned to give better riding qualities. The Brown-Lipe transmission is now used in standard production. Great care is being taken to prevent squeaking of the bodies by the use of an anti-squeak material where body and chassis parts come in contact. A top holder to be used if the top is lowered is furnished but not as an integral part of the body. When the top is up, the hole in the body which acts as the support for the top holder is covered with a metal cap. The Moon factory at St. Louis is producing 18 cars a day and the business for the first four months of 1921 is equal to that of the first four months of 1920.

The Readers' Clearing House

Questions and Answers.

CONDUCTED BY ROY E. BERG

Technical Editor, Motor Age.

Testing Defective Condenser

Q—What can one test for a defective condenser (a) when it is in the distributor and (b) when in the coil?

2—Is the millivolt meter test an accurate method of determining the condition of an armature? Explain.

3—How are armatures rewound?—Eric S. Hope, Dexter, Maine.

The location of a condenser makes no difference in testing and in either case it is necessary only to locate the condenser circuit and terminals.

Possibly the most common test is to disconnect the doubtful condenser and substitute one that is known to be correct. The results obtained when using the good condenser then will show up the action of the original condenser.

The most common trouble is the breaking down of the insulation causing what is usually known as a "Punctual Condenser." To test for this condition first make sure that at least one side of the condenser is not connected to any other circuit. Then using direct current, preferably 110 volts, make up a circuit as shown in Fig. 1. If lamp lights the condenser is shorted.

To test for the other faults, hold test points as shown in Fig. 2. Holding points on condenser terminals, touch points together and then separate them. If condenser is correct, there will be a short snappy spark when the points are separated. By comparing the spark of several condensers, you will soon be able to judge the condition of each.

2—In making a millivolt test on an armature, current is sent through the armature by connecting an outside source to the commutator bars that would be under the brushes. This gives the best distribution of current. The millivolt meter is now connected across the consecutive pairs of bars and measures the voltage drop across each pair. This drop is proportional to the resistance of the coils connected between the bars. A 10 per cent variation is allowable for slight differences in the resistance of the commutator bars and test circuit. A high reading then would indicate an open, a low reading, a short. Should the millivolt readings be very low, an increase of current through the armature will raise them.

(3) Mechanically, practically all of our automobile armatures are "hand wound," that is, the wire is taken directly off a spool and wound up in coils on the armature core. This may be done either by hand, or by use of a winding machine.

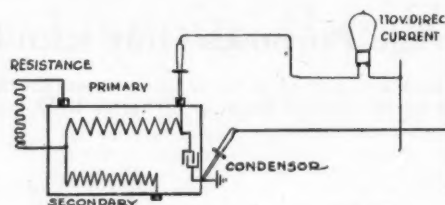


Fig. 1—Diagram of connections to be used when testing a condenser for break-down with a set of test points and a lamp with 110 volts direct current

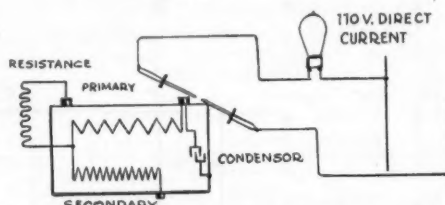


Fig. 2—Connections for testing a condenser for faults other than break-down

Electrically there are a great many methods of winding, so many in fact, that armature winding is a business by itself. You can, however, find several good books on the market fully explaining the subject.

1914 MICHIGAN WIRING DIAGRAM

On a 1914 Michigan car using a 16 volt Northeast starter generator it is difficult to keep the battery charged. Please publish a wiring diagram with single wire system for head and tail lights. Could a 6 volt ammeter be used by putting in some outside resistance? Would a Dodge 12 volt indicator work with this generator?—C. B. Douglas, 717 West 24th street, Pueblo, Colo.

You will notice in Fig. 4 that there is a neutral wire connected to the switch. Eight volt lamps are used, half of them from each side of the battery. This combination makes a grounded system impractical.

Unless an ammeter has sufficient capacity to carry the starting current, it could not replace the original indicator. The Dodge indicator that was used with the old four wire motor generator can be used. In neither case do you want to put any resistance in series with the indicator, as it would raise the line voltage, and possibly burn out the lamps and generator.

AMMETER CORRECTIONS

Q—Have installed an ammeter on a Dodge Brothers car. Publish diagram showing how this should be connected up so that when pressing starter pedal down, it will not show a discharge. Understand the current for starting an

Wiring Diagram of 1917 Willys Overland

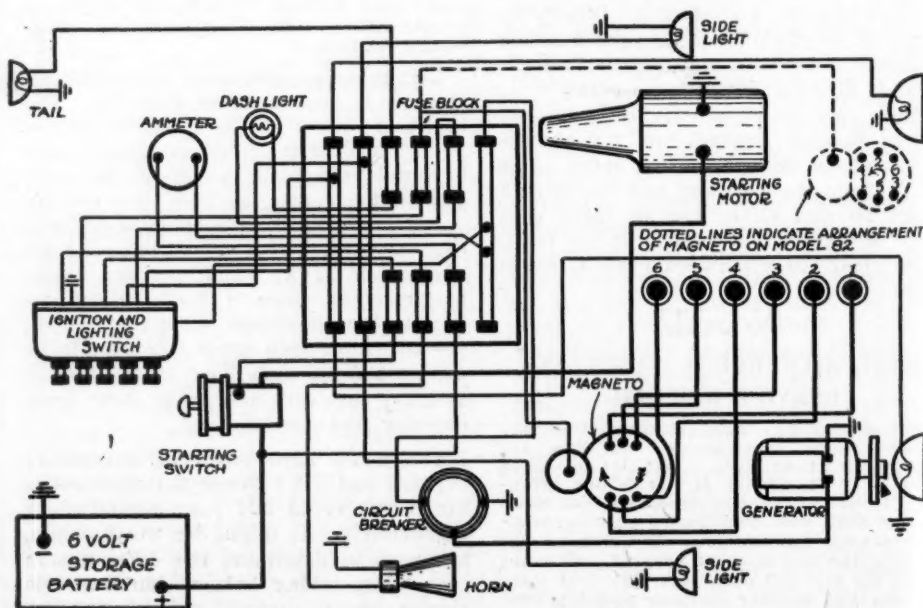


Fig. 3

engine should not pass through the ammeter.—George Fein, Cincinnati, Ohio.

We cannot tell what connections you have made but it is obvious that they are wrong if you are getting an excessive discharge when the starting pedal is pressed down. Fig. 5 shows the proper connections for the current indicator.

OVERLAND WIRING DIAGRAM

Q—Publish wiring diagram of the 1915 Willys-Overland, model 82.—R. F. Krill, Gary, Ind.

Shown in Fig. 3.

POLARITY OF BIJUR GENERATOR

How does a Bijur generator and battery polarity reverse itself?—Wm. Kasdorf, 101 Hadley street, Milwaukee, Wis.

Like any shunt wound generator the polarity of the Bijur generator depends on the polarity of the field. The polarity of the field in turn depends on the direction of the field current. The engine will always drive the generator in the proper direction so that a reversal of field current will reverse direction of induction and thereby change the polarity of the brushes.

The storage battery does not change its polarity and when the reversing plug is turned it connects the positive battery to the negative generator terminal. This is done in order to reverse the direction of current at regulator contact points and prevent them from pitting.

Fig. 6 shows a simplified circuit and the action is as follows: Assume generator is idle but has been running with reversing plug in position where ter-

The Readers' Clearing House

THIS department is conducted to assist Dealers, Service Stations, Garagemen and their Mechanics in the solution of their repair and service problems.

In addressing this department readers are requested to give the firm name and address. Also state whether a permanent file of **MOTOR AGE** is kept, for many times inquiries of an identical nature have been asked by someone else and these are answered by reference to previous issues. **MOTOR AGE** reserves the right to answer the query by personal letter or through these columns.

minals 1 and 3, and 2 and 4 are connected together. The upper brush would then have to be positive in order to charge the battery. The field current would then pass from right to left through fields in diagram. When reversing plug is turned over terminals 1 and 4 and 2 and 3 connected together, which means that battery negative is connected to generator positive. The generator being idle cut-out points would be open, and there would be current in battery generator circuit. When generator is started, it builds up, with top brush positive, to about 7 volts, which

closes cut-out points. The field is now connected to positive brush at one end and through regulator points and terminal 4 to battery positive at the other end. As the generator voltage is 7 and battery voltage 6, and they are opposing each other, the pressure across the field drops to one volt. This naturally drops the field current, weakens the field and causes the generator voltage to fall. Just as soon as generator voltage is less than that of the battery, the current in the field passes from left to right in the diagram. This reverses the polarity of the field, reverses the direction of induction in the armature. The generator then builds up in the opposite direction and the lower brush becomes positive. The lower brush is connected through 1 and 4 at the plug to the battery positive and the generator charges the battery as before.

Both pairs of contacts shown are operated by electro-magnets and their circuits make a complete diagram confusing.

Whenever the voltage rises above some set value, the regulator points are pulled open by the magnet. This inserts the resistance in series with the field, weakens the field and holds down the output.

REMOVING CONDENSER

Q—Advise the simplest way to take out the condenser from a non-vibrate induction coil and install a new one.—Frank K. Shibata, San Francisco, Calif.

If the coil is of the type which is filled with compound, there really is no simple way of removing any of the parts. The entire coil will have to be gradually heated until the compound is soft enough to allow the parts to be taken out.

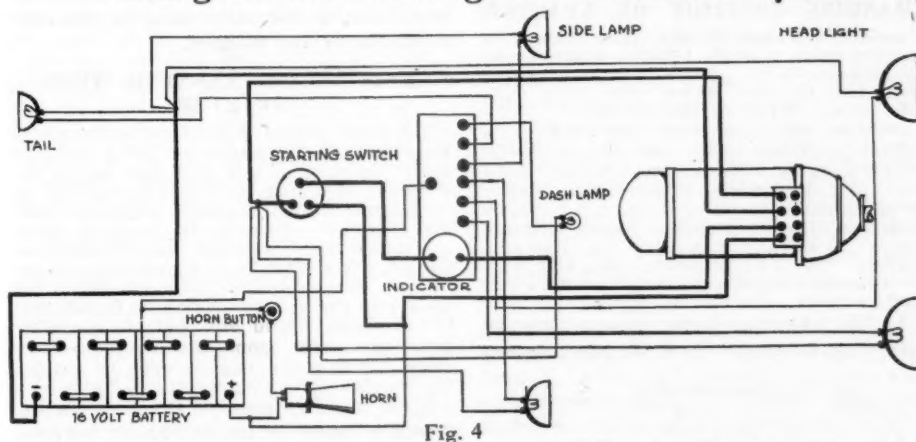
As a temporary repair, if the condenser is open you can connect another across the contact points. If it is shorted or punctured, however, you might, by removing the covers of the coil be able to open the condenser circuit by cutting the leads and could then install another one across the points as before.

DEFECTIVE MAGNETO COILS

Is there any way in which we could induce resistance between the magneto and coils on a Fordson tractor to overcome burning out of the condensers? The magneto appears to be too strong for the coil units as it burns out the condensers and the points burn off and stick.—Louis Olsen, Box 103, Lawton, N. Dak.

Your trouble is probably due to defective coils or vibrator adjustment. Should it be necessary to use resistance, however, connect it in series between magneto post and coil box. Resistance wire similar to that used in the ignition resistances found on such systems as Delco and Remy would be best to use.

Wiring of 1913 Michigan—Northeast System



Wiring of 1916 Dodge—Northeast System

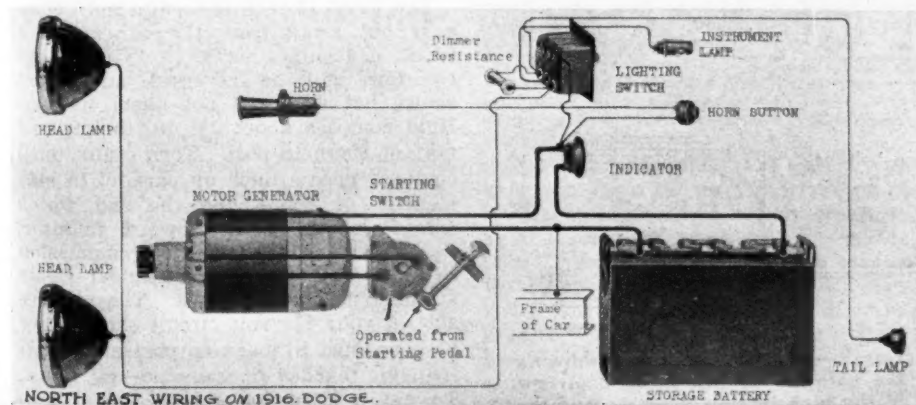


Fig. 5

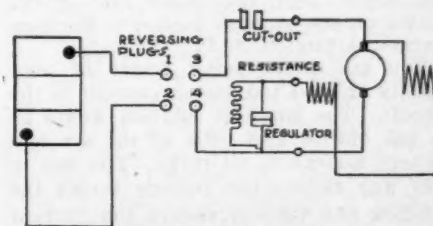


Fig. 6—Simplified diagram of the Bijur generator circuit

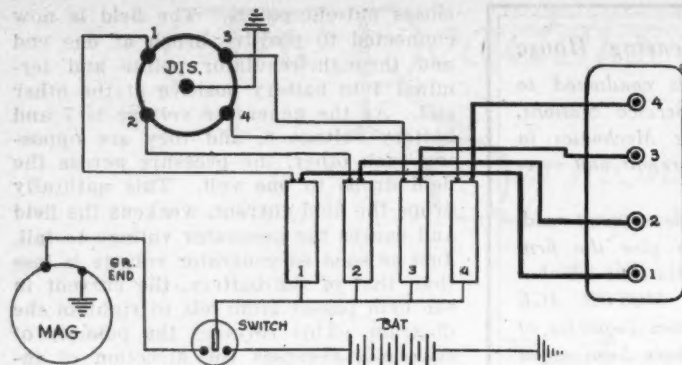


Fig. 7 — Diagram showing the primary and secondary circuits of the Ford ignition system. The high tension leads are indicated by heavy black lines

FORD IGNITION CIRCUIT DIAGRAM

Q—Publish diagram of Ford ignition circuit showing direction of current travel, both high and low tension, especially return circuit of high tension to coils.—Andrew Notensen, St. Hilaire, Minn.

Fig. 7 shows the ignition system. The primary circuit is indicated by light lines and the secondary or high tension circuit by heavy lines.

OVERLAND CUT-OUT ON GRANT CAR

Can a cut-out from an Overland car be connected up with a Grant car, and what kind of resistance coil is required for this? Kindly publish a wiring diagram for this cut-out connection.—O. E. Olson, Froid, Mont.

Both the 4 and 6 cylinder Grant cars used a combination vibrating regulator and cut-out that had four terminals. The action of the regulator was to insert resistance in the shunt field circuit whenever the charging rate got too high and thereby hold the generator output down. The Overland cut-out will work as a cut-out only, and in order to make the generator operate, it would be necessary to connect upper large and lower small generator terminals together.

Apparently this is what you have done and the generator, having no regulation, charges at a rate so high that the ammeter goes off the scale. A resistance could be connected between the generator terminals mentioned above, which would hold the output down but you still would have no regulation and while lower, the charging rate still would vary with the speed.

Fig. 8 shows connections to a Ward-Leonard regulator, as used on the 1915-16 Grant 4, and to get proper regulation it will be necessary to use some similar device.

IGNITER POINTS BURN OFF

The ignition points on a 6 hp. Fairbanks light plant engine burn off in a short time when a 6 volt storage battery is used. The lighting circuit is 32 volt 45 amp. Putting the engine on the lighting circuit through four 40 watt bulbs in parallel works better but the lights of the other circuits jump. Does too much amperage cause the short life of the points on the storage battery?—Meridian Garage, Arlington, S. D.

You are either using points of poor quality or have too high a current in the circuit. The simplest solution would be to use one or two cells of the six volt battery instead of all three. You can in this way reduce the voltage across the ignition and thereby reduce the current and by experiment determine which connection gives you the best spark and

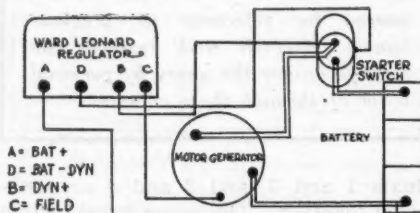


Fig. 8—Connections of the Ward-Leonard regulator used on the 1915 and 1916 Grant 4

longest life of the contact points.

If when fully charged, the gravity of the electrolyte is between 1260 and 1300, it is not permissible to add any acid. Adding acid would, of course, raise the gravity and prevent freezing, but when the battery was charged, the acid would be so strong that it would damage the cells. The best prevention against freezing is to keep the batteries charged.

CHANGING IGNITION ON TRACTOR

Q—Have changed the ignition on a tractor from a high tension magneto to an Atwater-Kent. Since then my tractor will not throttle down but runs O.K. otherwise. What is the trouble?

2—How can I increase the light on a Jeffrey? When the battery is fully charged up to 1300 sp. gr. I hardly have any light but when I speed the engine up to 20 m.p.h. it gives a fair light. Have installed high candlepower bulbs without result. This car has U. S. L. lighting system. Can you advise trouble and way to remedy same?—Harry Lechro, Abilene, Kan.

1—The Atwater-Kent system should give you a better spark at slow speed

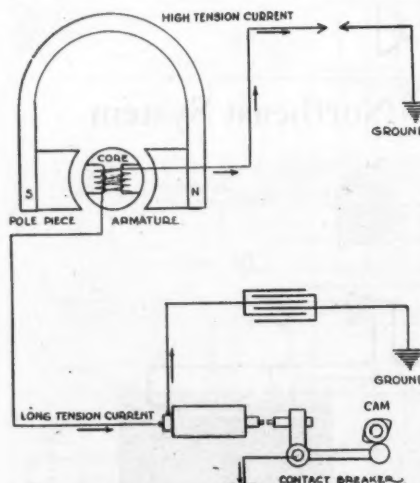


Fig. 9—Simplified diagram showing the path of the low tension current in the high tension magneto and the method of connecting the condenser

than the magneto. If no other changes have been made, our suggestion is that you check your timing and make sure that the spark occurs just after top center when interrupter is in its retarded position.

2—There were three different models of the Jeffrey using U. S. L. systems, and as you do not state which you refer to, we cannot give you very definite information. All the models used a split voltage system some 12-24, others 6-12. First check the marking on the lamps; it should be half the total battery voltage. For example, the 6-12 volt system used 6-8 volt lamps. As the lamps are dim when engine is idle but brighten when running, you undoubtedly have some extra resistance in the battery circuit, due either to battery trouble, loose connections, dirty contacts or partially broken wires. Check the entire circuit carefully looking for the above and you will, no doubt, find the trouble.

MAGNETO CONNECTIONS

Q—Publish diagram of high tension magneto armature explaining how the low tension wires are connected to the interrupter and how the interrupter is connected to the condenser.

2—Is a recharged magnet as good as a new one? Will it last as long as one that has been charged at the factory?—Gerald F. Hoffman, Princeton, Ill.

1—Fig. 9 is a diagram of the connection which is self explanatory.

2—If the recharging is properly done the magneto can be fully charged and will give as good results as a new one. The length of time that a charge will be retained is largely dependent upon the properties of the steel used in the construction of the magnet.

RECHARGING MAGNETO WITH STARTER

We have installed a wiring with which we charge Ford magnetos using 110 volt direct current circuit and salt water resistance, and find it very satisfactory in recharging Ford magnetos without starters. However, charging the magneto with a starter the magneto was completely ruined. We first use a compass so as to set the magnetos properly with the coils and on this occasion we found that the compass would not indicate correctly pointing away from the magneto post after turning the engine over in setting it.—Sandoz Auto Co., Verdigré, Nebr.

With the exception of the rack on the flywheel there is no difference between the Fords without and with a starter. The battery or other apparatus would not affect the compass.

The usual method is to first hold compass out away from the car and see which end points north. Very often the compass will be reversed and point south, but this will not affect its use. Hold compass about 1 1/4 in. to left and rear of magneto post. Turn crank until compass needle lines up parallel to side member of frame and the end which pointed north, points toward radiator. As an extra check, remove transmission cover and see that magnet holder rivets straddle the magneto post. The positive side of your 110 volt circuit should now be connected to magneto post and negative side touched to frame several times. To get a good job repeat four times, turning crank about a 1/4 turn each time.

ENGINES

OIL PUMPING

Q—The engine in a Pilot 6-45 pumps oil. Have tried various kinds of so-called leakproof rings and also different oil rings without obtaining any satisfactory results. Have installed patented rings, the rings being ground to seat in the grooves and fitted to cylinders but the engine continues to pump oil. The cylinder walls are not scored or burnt. Would beveling the third and fourth rings have any effect in this case, and if so, which way should bevels be placed? The engine is a Teetor-Hartley—L. H. Robinson, Kansas City, Mo.

The installation of new rings will not correct oil pumping if the cylinders are worn, and there is perceptible ring travel wear. If you will remove the pistons and micrometer the cylinders carefully you will undoubtedly find that they are worn out of round. The only correct way to overcome the trouble is to re-grind or re-bore the cylinders and fit new pistons and rings. It is absolutely impossible to get a perfectly round cylinder through the use of the lapping in process. At the present time there are many companies that make a specialty of regrounding and fitting new pistons and rings.

With the exception of the actual re-grind the cost of supplying and fitting the necessary parts is the same no matter what method is employed. In most cases the price of a regrind is no more than the time charge that would be made if lapping in was resorted to, and you are assured of getting a true cylinder bore and properly fitted pistons. The kind of a piston ring used will do very little to correct oil pumping if the cylinder wear is excessive and it is hardly reasonable to expect that a ring can compensate for an out of round condition and perceptible ring travel wear.

GRINDING FRANKLIN VALVES

Q—What kind of valves were used on the 1920 Franklin?

2—Explain method of grinding them in.

3—The engine runs slow all right but has no power when pulling up a hill. Have put on new points in timer and burned carbon out of engine and changed engine oil. All plugs are good. Please state what causes this and how it can be eliminated.—R. F. Sefzik, Dubuque, Ia.

1—Both intake and exhaust valves are made of chrome-vanadium steel; the exhaust valve has a thin ring of cast iron welded to its seat to counteract pitting. The openings are 5/16 in. for the intake valve and 9/32 in. for the exhaust valve. The common diameter is 1 5/16 in. Valve operation is by means of a single camshaft working through valve lifter rods and walking beams. The entire mechanism is enclosed and is designed to compensate for any effect of expansion.

2—To regrind the valves, the cylinders must first be removed. To remove a valve, hold it seated with a block of wood, compress the spring and let the pin fall out of the stem. Remove the safety wire and withdraw the valve. Care should be taken that the exhaust

and intake valves are not interchanged. The head of the exhaust valve is convex while the intake valve is flat. Before grinding, scrape the valves and cylinders free from carbon. Grip the support flange of the cylinder in a vise and insert the valve with a small amount of fine grinding compound on its seat.

Rotate the valve back and forth by means of a nail or a piece of wire through the stem. Turn valve around frequently so that it will not be ground in at only one point. Using a brace instead of a nail makes the operation much easier when the valves are in bad condition, but care must be taken not to apply too much pressure so as to bend the valve stem. Before assembling valves, immerse the cylinder head in a pail of gasoline and thoroughly wash out all of the grinding compound. In assembling be sure that the safety wires are in place.

After the valves are assembled with their springs, test for leaks by filling the exhaust and intake parts with gasoline. Be sure that the valve springs have the proper tension before cylinders are placed on the engine. The valve springs are made of chrome-vanadium steel. All springs should have approximately the same tension, otherwise, the valve mechanism will be noisy or the engine will run irregularly. The valve springs when supporting a weight of from 25 to 28 lb. should have just enough tension to seat the valves. The use of a 1/32 in. washer under the spring will increase the tension approximately 1 lb.

3—The lack of power on the hills may be due to lack of compression, leaky intake connections, or incorrect valve timing. We cannot tell the exact cause of the trouble without more detail and therefore, we suggest checking the items mentioned and see if the source of the trouble cannot be located. If you find that there is considerable loss of compression due to worn pistons and cylinders it would be advisable to have the cylinders reground or rebored and new oversize pistons and rings fitted.

FORD ENGINE KNOCK

Q—A Ford was completely overhauled last August, cylinders rebored and new bearings installed. The engine idles perfectly and makes no noise going down grade or on the level but has a very decided knock on a hill. This knock has, for the last few weeks, been growing worse. The bearings are tight and apparently no piston slap can be located. What is the trouble?—George H. Sanford, Billerica, Mass.

The common troubles which are not apparent when the car is driven on the level under light load but which become very perceptible on a hill are as follows: Lean mixture, poor seating valves, excessive carbon deposit, loose wrist pins and sticky valves. If it is a case of too weak a mixture the difficulty can be overcome by adjusting the carbureter. If an attempt is made to climb a hill with the spark advanced too far a knock will always result.

There is a possibility that the connecting rods are slightly sprung which would cause a knock and also piston slap. The fact that the block was rebored last August does not mean that the cylinder has not worn enough to give piston slap. If the bearings have been taken up recently and there is a piston slap or loose wrist pin it will be much more pronounced.

FITTING PISTONS

Q—Is this a satisfactory method of fitting pistons: Rebore the cylinder, heat the same old pistons, expanding them, turn them in a lathe to true them up and then use them in the rebored cylinder again?

2—What is the hp. of the Buick B-24? What is the speed of this engine?—Howard Berry, Zealandia, Sask.

The above outlined method of fitting pistons will not prove satisfactory. If the block is being rebored for the first time about .010 in. of metal will be removed. It is impossible to get enough expansion to make up for this difference in the size of the cylinder bore and after the piston is ground true the clearances will be very much too large. It is important that the piston and rings fit properly if the engine is to operate efficiently and, therefore, it is a poor investment to have the job done unless accurate methods are used.

The Buick B 4 is rated at 22 hp. but develops about 28 hp. We do not know at what speed the maximum hp. is obtained.

WASHING EQUIPMENT

Q—Publish a list of the manufacturers building special equipment for washing cars.—U. S. Specialty Co., Boston, Mass.; P. M. Lattner Mfg. Co., Cedar Rapids, Iowa.

Many of the service stations use washing equipment that has been designed and built in their own shops. The Tate Motor Co. of St. Louis has a system using 150 lb. of air pressure combined with the normal city water pressure of about 60 lb. The proportion of air to water when passed through the nozzle has been determined by actual experiment. A full description of the system was published in the March 17 issue of MOTOR AGE.

BURNING IN BEARINGS

Q—Which is the proper way to burn the bearing in on a Ford engine; burn them in dry or with oil when they are in the 'burning-in' stand?—Wm. Haith, Watson, Mo.

Bearings burned in at the Ford factory are burned in at high speed and dry. Burning in a set of bearings requires some skill and without considerable experience many jobs may be lost. Bearing caps should be so that they have about 1/4 in. rock and then bolted down as tight as possible without the use of pins. If a slow speed outfit is used it will require about five minutes to burn the set in. Care should be taken to see that temperature remains a little below the melting point of the babbitt. After about three minutes of operation, a little oil may be poured over the bearings. After assembling the engine, it should be run in with oil for about two hours before it is allowed to run under its own power.

MISCELLANEOUS

CHANGING OIL

Q—Explain how to clean all the old oil out of the distributing tubes and oil pump before adding new oil in a Dodge Brothers engine. Please publish diagram of the oiling system on this car.

2—How fast is a Dodge Brothers engine running when the car is traveling at the rate of 25 m.p.h.?

3—What is the maximum hp. and r.p.m. of a Dodge Brothers engine?

4—Why does the Reo company put only the inlet valve in the head?—Gerald Hoffman, Princeton, Ill.

1—We do not believe that it is necessary to clean out all of the oil from the distributor tubes and oil pump unless there is some obstruction in the oil leads. If the oil has not been changed for a long time it would be advisable to remove the oil pan and clean it thoroughly. If the crankcase is filled with kerosene and the engine turned over with the starter a few times the system will be flushed out very well and the lines cleaned. New oil can then be placed in the crankcase.

2—When the car is traveling at a speed of 25 h.p. the engine is turning over about 1100 r.p.m.

3—The Dodge engine develops 35 hp. at 2200 r.p.m.

4—This is a question that cannot very well be answered because the valve location is a matter of design that is determined by the engineering department of the company.

HUP CLUTCH ADJUSTED

Q—When the clutch on a Hupmobile, model N & R is pushed out, the transmission does not stop and makes it almost impossible to get into low gear when starting off. What causes this and how can it be eliminated?—Wm. E. Scott, Claude, Tex.

The clutch on these models is of the multiple disk type saw steel disk running in oil. No adjustment for spring tension is provided. When the clutch is released to the full throw of the clutch pedal a clutch brake operates to assist in stopping the transmission gears and allowing the change of gears to be made easily. The only clutch adjustment is in the throwout control. The clutch pedal operates on a trunnion shaft, with trunnion lever connected directly with a connection to the clutch-cam lever, which bears against the end of the clutch push rod extending through the transmission case to the clutch throw-out yoke.

The clutch cam lever is provided with holes at different distances from the cam which arrangement changes the pressure necessary to disengage the clutch and also changes the distance necessary for the clutch to be thrown out before the clutch brake will become operative. When the clutch trunnion connection is made at the lower hole in the clutch cam lever, a little more pressure is required to disengage the clutch, but the clutch will operate more quickly. When the connection is moved to a higher hole, less pressure is required to disengage the clutch but the brake will operate more

smoothly. This adjustment may be changed to suit the convenience of the driver. It would be advisable to clean the clutch out thoroughly with kerosene to remove any sticky oil that may have accumulated on the disks.

CARBURETER LEAKS

Q—Why is it that in cold weather carbureters will leak whereas when it is warm they will not?—Gerald F. Hoffman, Princeton, Ill.

We are inclined to believe that the leakage is caused by the float level being too high or perhaps a sticking float. When the weather is cold there is always more or less condensation in the manifold and it is possible that enough raw gasoline collects in the manifold to drain back and cause leakage. Many drivers open the throttle when shutting the engine down and in cold weather this would have a tendency to cause flooding.

MERCER GEAR RATIO

Q—Advise gear ratio and regular size wheels of a 1912 model 35-R Mercer.

2—What speed would this car make with regular ratio and 32 by 4 tires?

3—Would changing the carburetion system, the gears in the rear or changing the engine in any way as regards valve or ignition timing increase the speed of this car?—Jack P. Heidenfelder, Brooklyn, N. Y.

1—The gear ratio used for this model was $2\frac{1}{2}$ to 1 and the wheel size was 32 by 4.

2—The car was guaranteed to make a mile in 51 sec.

3—The speed can probably be increased by using lighter reciprocating parts, increasing the valve size and advancing the timing one tooth. The use of a carburetor designed to handle the present fuel will undoubtedly improve the running. If the car is in good condition it will make the speed guaranteed which is about 71 m.p.h. and this is sufficient. The gear ratio should not be changed as it is low enough to give all the speed desired.

BODY POLISH

Q—Do you consider equal parts of turpentine and linseed oil a good preparation for preserving the finish on automobiles?—Dal Trescott, Elkhart, Ind.

Turpentine and boiled linseed oil makes a very good body polish. It should be used sparingly and after application the body should be rubbed absolutely dry. The turpentine has a cleaning effect and the oil has a tendency to close up all of the cracks that are present in the varnish.

DODGE AXLE ADJUSTMENT

Q—Would like to know what causes a grinding noise which seems to be in the transmission as it cannot be heard when the engine is idling. When the car is in gear and running up to 15 or 20 m.p.h., and after attaining this speed, the noise cannot be heard. It will also return when the speed falls below 15 or 20 m.p.h., and by merely lifting the foot off the accelerator will, at times, disappear. This is on a Dodge Brothers car.—George Fein, Cincinnati, Ohio.

The indications are that the noise is being telegraphed from the rear end by the propeller shaft. There is a possibility that the propeller shaft bearings are worn or dry but there is a greater probability that the pinion needs adjustment. The propeller shaft is mounted on two adjustable roller bearings which are fitted in the differential carrier. With the bevel pinion rigidly attached to this propeller shaft the whole shaft can be adjusted endwise to obtain the exact position of this driving pinion in reference to the bevel gear bolted to the differential.

Two adjusting rings fitted against the bearings can be screwed forward or backward to obtain a proper adjustment. These rings can be reached by removing the ring lock which is bolted to the top of the differential carrier. To adjust the pinion back off one of the rings and screw the other ring up the same amount. Make sure that each ring is holding its bearing rigidly before replacing the lock. To adjust the bevel gears to the quietest running position, jack up the rear axle and run the engine with the gears in direct drive at about 20 m.p.h. as indicated by the speedometer.

After removing the ring lock adjust the bevel driving pinion, then remove the rear axle cover plate and the two small adjusting ring lock screws in the differential carrier and readjust the ring gear to the new position of the pinion. Be sure to lock all of the adjusting rings after the adjustments have been completed.

REPAIRING BUSHINGS

Editor MOTOR AGE.—When overhauling engines, if the piston pins are found to fit the bushings too loosely, they can be made as good as new by pressing the bushings out of the connecting rods and applying a thin coat of solder to the outside of the bushing, then pressing it back into the connecting rod. It is a good plan to bevel the edges of the hole in the rod slightly with a round file so it will not shave off too much of the solder. The hole in the bushing may be too small now and need reaming the same as a new bushing. When replacing the crankcase on a Dodge Brothers car, difficulty is sometimes experienced in keeping the wire oil gage in the hole in the engine block. This can be overcome by slipping a cotter pin over the wire after it has been slipped in the hole in the block. Francis J. Joslin, Independence, Iowa.

GREASING WHEEL BEARINGS

Q—Explain how to grease the wheel bearings of a Dodge Brothers rear axle.—Gerald Hoffman, Princeton, Ill.

The front and rear wheel bearings should be cleaned and repacked with clean grease every 2,000 miles. To lubricate the rear wheel bearings, remove the cap, drive flange and drive shaft attached to it. Loosen the clamp screw, unscrew the rear wheel bearing adjusting nut and pull off the wheel. In pulling off the front and rear wheels, the outer roller bearings will come with them. Remove the inner bearings, clean, pack with grease and replace them.

After doing the same with the outer bearings the wheel should be replaced and the bearing nuts adjusted as follows: Turn the adjusting nut up tight. Spin the wheel a few times by hand, then back off the adjusting nut enough to allow the wheel to oscillate slightly and then lock the adjusting nut in place. Approximately 1/3 of a turn will be found a sufficient amount to back off the nuts. Be sure that the adjusting nuts are locked securely after the adjustment has been made.

1917 MAXWELL WIRING

On a 1917 Maxwell wiring does the ground wire run from the lower left hand corner to the frame?—F. C. Stroker, Olney, Mo.

There were two types of dash panels used on the 1917 Maxwell, one had three and one four terminals on cutout side of the fuse panel. They are plainly marked and the circuits differ only at the point where BAT. is connected to panel.

A one wire or grounded system of wiring is used and wiring should be connected to the frame at the following points:

The negative battery terminal with wire led out opposite direction to the other three.

The large short post terminal on starter switch.

The terminal marked (DYN—) on the fuse panel is connected to a small switch near starting switch. This switch should open when starter is used and ground DYN— when car is running.

The motor dynamo, lamps, horn and ignition are grounded internally and need only to be fastened securely to their proper position.

DUESENBERG CAR

Q—Where are the Duesenberg racing engines made and are they assembled into stock or racing cars?

2—Where can one obtain literature, etc., on this car?

3—What does this car sell for?—Claude Downen, Havre, Mont.

1—Information concerning the Duesenberg engine can be obtained from the Rochester Duesenberg Co., Rochester, N. Y. These engines are assembled in stock cars.

2—Literature, catalogues, etc., can be had by writing the Duesenberg Motors Co., Indianapolis, Ind.

3—The Duesenberg car sells for \$5,000.

CARBURETER JET

Q—On a 1917 Oakland there has been installed a dash control to carbureter needle and valve. Owing to jet being too small there is not enough range of operation. Would not the present day heavy fuel require a larger jet?—Dal Trescott, Elkhart, Ind.

From the brief description we do not know just what kind of an adjustment has been installed. However, the structure of the fuel has changed considerably since 1917 and it is safe to say that many changes have been made in the design of carbureters. With the heavy grade of fuel now on the market a larger jet is desirable.

CLEANING BATTERY

* Q—Why is it necessary to reinsulate, replace acid, wash battery and clean it at times and why does it take so much distilled water after these operations? The battery I have in mind seems to require too much water. It gives good service but has to be filled with water too often. What causes this and how can it be remedied?—Geo. B. Brogg, Brownfield, Texas.

After a period of use, a storage battery, like any other piece of apparatus, requires some attention and renewal of some parts in order to give the best of service. The operations you mention are to the storage battery, what scraping carbon and grinding valves are to the automobile engine.

Water is lost in two ways, either by a leak in the battery jars or given off in the form of gas while battery is charging. Your trouble is probably due to the better battery action caused by the cleaning. This would allow it to charge faster and cause a lot more "gassing." The gas lost has to be replaced with water. Our suggestion would be to first test for any leaky jars, and then reduce the charging rate.

INSTALLING VALVES

Editor MOTOR AGE: Have just read Abe Law's question from Indianola, Iowa, in regard to installing Fordson valves in the Ford engine. I have done this myself and if it will help him in any way I will be pleased to describe how I did this.

I got a valve reseater sold by the Ford agencies as a Ford tool and started in just as if I were going to reseal a valve and bored it down almost to the port. I was afraid to go down any farther for fear of breaking through the pocket. What was left I chipped out with the chisel also the abrupt edges down inside of the pocket.

Then I ground in the tractor valves making a good wide seat. When I had done this I took the valves on the emery wheel and ground all the head outside of the seat. This was necessary to give room inside of the cylinder head. Then I cut off the stems, drilled holes and put them in as usual. I found this worked very well as the stems are the same size and when the job was done I was well pleased with results.—Ralph L. Cowan, Stratton, Nebr.

DIM LIGHTS

Q—The lights on a 1920 Ford become dim at low speed and flare up at high speed. The change of lights occur when the voltage of the generator drops below that of the battery and the points of the relay are open. The lights are dim when the points are open and bright when the points are closed. What causes this and can you advise remedy?—Claude Press, Blue Ridge, Texas.

The only reason that the lamps flare up is that the instant the relay points close the line voltage rises. This is due to some high resistance in the generator battery circuit, or trouble in the battery itself. The fact that the lamps are dim when the generator is idle also shows the same trouble.

Starting at the battery, clean and tighten all the connections and terminals until the lamps burn brightly when generator is idle. Remember when doing this that ground connections are just as important as any others.

If the generator-battery circuit has no extra resistance, when the relay points close, the battery is connected across the generator and prevents the voltage from rising to any appreciable extent.

IN THE PAINT SHOP

Equipment for Small Paintshop

1—Please send cuts and prices on a small outfit for automobile painting on a small scale.

2—What makes enamel dry with rough grit in it? Is it my fault or the fault of the enamel?

3—Where can I get the paint?—C. W. Welsh.

1—A small outfit for automobile painting on a small scale would consist of the tools and materials that you have been using, as you state that you have been enameling cars for a year. Fewer operations than what you are using would not be possible. If you were really going to engage in the business of painting automobiles you would have to equip yourself to handle all kinds of work, and this would require a line of tools and materials that would by no means be simple; and if you do not understand their use your investment would be thrown away. The application of a coat of motor car enamel is by no means "automobile painting" according to the trade definition of the term. If your knowledge of the work is limited to the use of the enamel we would advise that you seek further knowledge of the trade by working in a shop or taking a course of instruction. In this way you will learn how to do the better grades of work where enamel is not used. Motor car enamels offer a quick and cheap method of reviving the color and luster of old paint coats where fine surfaces and finishes are not required, but for the best grade of work surfacing materials and varnishes must be employed.

2—The fact that your enamel coats dry with what you call "rough grits" in them is no doubt your fault. If the material is properly mixed before applying, the pigment that it contains would not act in this way. But if the surface is dirty, or if your brushes are dirty the coat of enamel would appear as you describe.

3—If you know what you want to order you can get the materials from any of the following Chicago firms: Valentine & Co., Murphy Varnish Co., Devoe & Reynolds, Chicago College of Auto Painting.

The Accessory Show Case

New Fitments for the Car

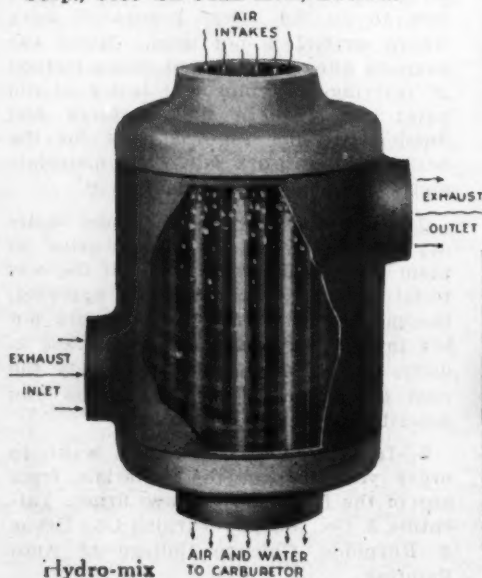
Automobile Match Box Holder

The Newton Mfg. Co., Newton, Iowa, manufacturers of advertising specialties, make a safety match box holder which can be attached to the steering wheel of an automobile. On a number of machines it may be fastened on the spark lever.

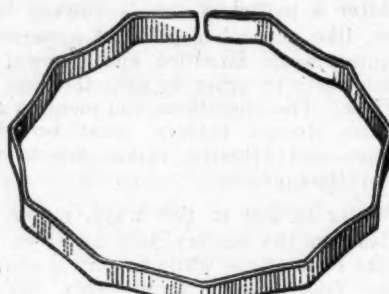
It is made of gage iron, in black enamel finish with the advertisement printed in gold bronze. It can be quickly attached by simply slipping the clamp around the spoke and adjusting the bolt. In addition to the advertising feature, this accessory proves a convenience for the driver enabling him to secure a match and strike it with one hand, still keeping control of the car. Newton Mfg. Co., Newton, Ia.

Hydro-Mix

Designed to add power to a car by humidifying the gas mixture, Hydromix is claimed to clean out the carbon already formed and to prevent further formation. It distills the unburned gases of the exhaust and returns them as combustible liquid to the carburetor intake. At the intake end of the tubes, the in-rushing air cools them, condensing on their outer surfaces the gases carried past by the exhaust. The drops flow down into the venturi tube. The number of tubes and their length are designed to supply the proper flow of condensed gases at all times. The tubes dry instantly the engine is stopped eliminating the danger of too much water. This device serves also as a means of quick starting in cold weather, the tubes being highly sensitive to heat. Planet Mfg. Corp., 5088 St. Jean Ave., Detroit.



Hydro-mix



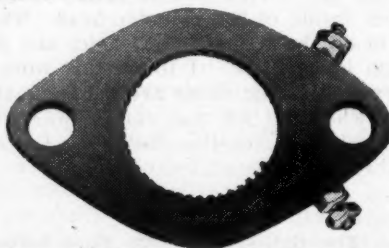
Apex innering



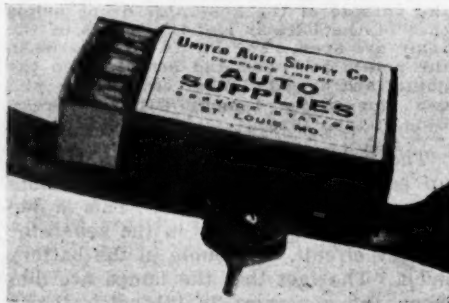
Kelly piston ring

Apex Innering

An innering which is a piston ring expander has recently been placed on the market by Thomson-Friedlob Mfg. Co., Peoria, Ill. It is claimed that these innerings will stop piston slap and prevent oil pumping where old pistons and rings are used. In the case of the installation of new piston rings they will assist in keeping the ring pressure on the wall uniform. The innering is made of a high grade Swedish steel and its quality is determined according to the size of the piston and the pressure necessary. The price is 30 cents each for rings to fit cylinder bores of 5 in. and less and 50 cents each for all sizes over 5 in.



G & G manifold heater



Newton match box holder

Standley Luggage Carrier

The Standley luggage carrier is adjustable to any length from 10 to 65 in. When not in use it may be folded up and placed under a seat. It fastens securely to the running board by means of clamps, and no tools are required to attach it. It is made in but one size which will fit any motor car. The Standley Skid Chain Co., Boone, Iowa, also manufacture the Standley Kiddie Carrier.

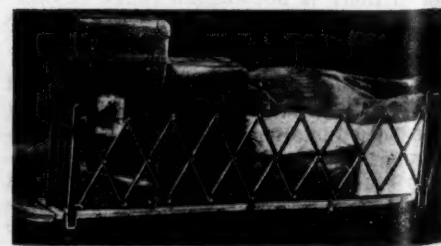
Kelly Piston Ring

Kelly one-piece piston rings are cast individually, elliptic in shape, of a high grade refined gray iron and heat treated to prevent warping. They are lathe turned on the outside circumference which process leaves a series of minute grooves that are claimed to reduce the "wearing-in" surface to a minimum and eliminate the use of lapping-in compounds.

The reinforced "L" shape construction of the joint is said to make this piston ring indestructible and the sliding contact enables it to hold both oil and compression to a point far beyond any wear it will receive. These rings are guaranteed to eliminate all carbon and produce higher compression. Prices range from \$1 to \$1.75 according to size. Kelly Piston Ring Co., 1900-1904 Third street, N. E. Minneapolis.

G & G Manifold Heater

A very interesting type of electric manifold heater is made by the G & G Electric Heater Co., of LaFayette, Ind. This heater is inserted between the carburetor and manifold. Its opening is the same as that of the carburetor and thus no restriction to the flow of air is produced. An electric heating coil is set into a groove in the heater which completely surrounds the circumference of the device. The electric coil is connected to the battery through a switch for the dash. Fifteen amperes of current is consumed. It is made in all sizes from 1 in. to 2 in. and in special adaptations. Its price is \$6 including a switch and pilot light.



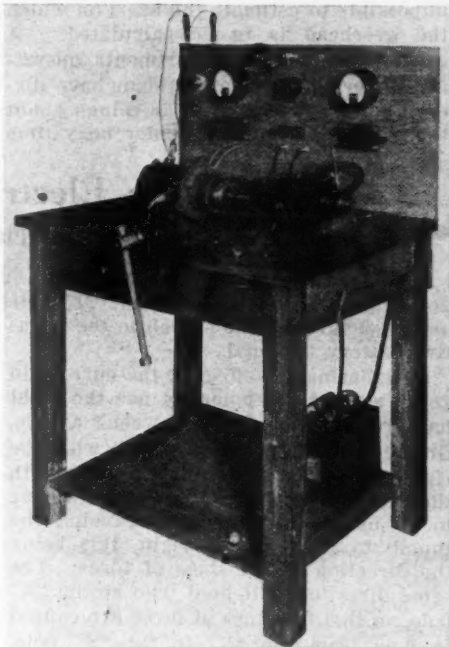
Standley luggage carrier

Service Equipment

Time Savers for the Shop

P-R Electric Testing Bench

For testing motors, generators, magnetos and armatures at any rotation and any speed, the P-R Electric Starter Co., 7335 Vincennes avenue, Chicago, have designed an electric test bench which sells for \$290. A six volt motor operating off the battery is used to operate the bench for generator tests. The motor operates the generator and the generator charges back again into the hand switch to the right which changes the test points to 2 volts through the ammeter and tests are made from bar to bar. If the ammeter readings are the same all around then the armature is O.K. but if at any place the readings are low or high, it indicates an open or a short. In case the high voltage test is again needed it is only necessary to turn the switch back to the left. The motor at the back of the bench is mounted on a track enabling it to slide sideways to line up the chain for either left or right rotation. It is also pivoted to rock backward or forward to adjust the chain for any size machine. When a generator is ready to be driven, the starting switch on the lower shelf is operated by foot and the speed regulated by a rheostat. The variation in speed is such that the motor can be made to just barely move or to drive any 6 or 10 volt generator, it is claimed.



P-R electric testing bench

To operate the bench for starting motor tests, the machine is installed in a similar manner except a special cable from under the bench is used and attached to the motor. Changing one connection on the bench leg gives the full power of the battery to the motor when the starting switch is operated. The rear motor then acts as an idle pulley and on its shaft a torque arm is placed and the torque of the motor is read with a spring balance stand supplied with the stand.

The P-R Electric Starter Co. are also putting out a smaller bench designed on similar lines for Ford generators and starters only. It uses belt instead of chain drive with V type pulleys to prevent slipping. This model sells for \$200.

Universal Aligning Machine

A universal aligning fixture for aligning connecting rods and pistons on all makes passenger cars, trucks and tractors has been placed on the market by The Eagle Machine Co., Indianapolis, Ind. With this machine it is possible to align up the connecting rod alone or assembled with the piston. It is equipped also with a small vise clamp which makes it possible to straighten the rod in the vise. The Universal bushings which are part of the equipment are designed to take care of all sizes of connecting rod bearings from 1 1/4 in. to 2 1/2 in. in diameter in .001 graduations.



Power cylinder reboring mill showing equipment furnished

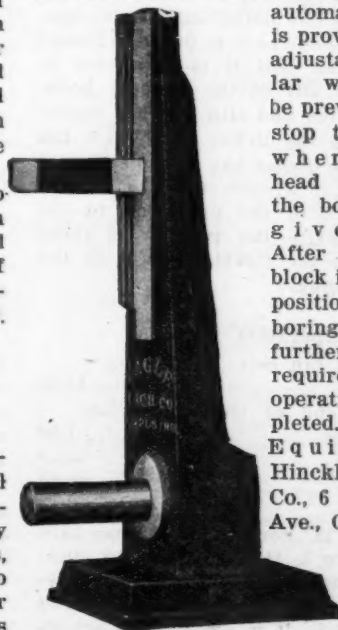
Power Cylinder Reboring Mill

Any open head cylinder block, the extreme over all height of which does not exceed 20 in. and cylinders from 2 13/16 to 5 in. in diameter can be rebored with this machine. In operation only one horsepower is consumed and accurate results are guaranteed. The base plate is only a few inches above the floor which makes unnecessary the use of a crane or block in handling the majority of cylinder blocks.

Cylinders are automatically set to a perfect center, it is claimed, by means of the hardened tapered centering fixture. This fixture is split and fits around the pilot bar which is located at the bottom in a hardened steel bushing. After the cylinder is centered, it can be quickly and securely clamped to the base.

The cutter head contains three adjustable cutter blades, each blade being set independently and accurately by a micrometer gage to the exact oversize desired. This adjustable cutter head is then mounted on the cutter tube, or boring bar. The cutter bar is then lowered toward the cylinder until the positive locking clamp rests on the top of the cylinder block.

The clamp is rigidly secured to the base of the mill ready to begin the boring operation. The boring bar is fed automatically and is provided with an adjustable stop collar which should be previously set to stop the boring when the cutter head has reached the bottom of the given cylinder. After cylinder block is once set in position and the boring started, no further attention is required until the operation is completed. Dearborn Equipment & Hinchley-Myers Co., 6 Michigan Ave., Chicago.



Eagle universal aligning machine

Establishing a Fixed Price System

(Concluded from page 14.)

DECIMAL SYSTEM EXPLAINED

The Master Chart is laid out in nine major divisions. These consist of:

- | | |
|---|---------------------|
| 1—General lubrication and miscellaneous | 5—Propeller shaft |
| 2—Engine | 6—Chassis |
| 3—Clutch | 7—Steering gear |
| 4—Transmission | 8—Electrical system |
| | 9—Body |

The heading numbers as given for these major units are the code numbers for the operations in any particular division. Thus when we speak of the engine in general the number is 2, but if we speak of let us say the valve gear the number will be 2 followed by another, or, in our case, the valve gear in general is headed under 22. Individual operations may then be adding another key number.

There are many peculiar operations to take care of under each classification, otherwise conflict will occur which may lead to trouble in the billing and explaining to the customer. For example, the frame is to be straightened. This operation sometimes requires that the body be removed if the damage is back of the front body connections. In these cases it would not be wise to list the whole thing as one operation. Remove body and straighten frame.....\$.00 but it would be better to list each operation separately and then the owner would appreciate the work that is involved.

WRITING THE REPAIR ORDER

When writing the owner's confirmation copy of the bill, it is always best to follow a certain routine in the listing and billing of the items. Let us illustrate this with the renewal of a fan belt. A fan belt costs one dollar on the average. However, on some cars in order to install an endless fan belt it is necessary to remove the front engine support bolts, raise the engine and slip the belt under. So in writing the ticket for a new fan belt which the dealer has been instructed to install, it is always well to explain the intricacies of the operation to the owner and write the routine of these operations on the ticket perhaps in the following manner:

Operation 2442	
Install new fan belt	
Fan belt	\$1.00
Raise front end of engine to slip belt in place.....	1.50
Total.....	\$2.50

Following in general the procedure outlined above is the only way to eliminate complaints. The fixed price system apprises the owner of the cost of the work before it is done. The scheduling of the routine on the work clarifies the situation and makes it unnecessary to do the explaining afterward, as it is always the belated complaint that causes the trouble. A complaint ironed out before the work is started finishes an

argument, but a complaint instituted after the work is done and before the bill is paid may very often lead to difficulties with the collection department.

A follow-up system must be instituted on the men to see that the time limits are being held to, otherwise it will be impossible to estimate the basis on which the overhead is to be calculated. A great many service departments operating under the flat rate system have discovered some very peculiar things about the men when working under boggy time

allowances. For example, the task of valve grinding was costing the owner about \$18 before the flat rate system was installed, but after the flat rate system was installed and the boggy time of 5 hours listed for this operation it was found that the men were continually getting the work done in 5 hours, thus saving one hour. Therefore, the shop found it convenient to cut the labor on the estimate this amount and accordingly reduced the bill. There are many things that will be noticed in connection with flat rate service operations that make it very apparent to the dealer that the system should have been considered long before it was.

How the Electric System Works

ARTICLE IV

(Concluded from page 32.)

goes through the coil on the "N" pole and back through the switch to the negative battery terminal.

Considering the effect of the current in going around the poles we use the right hand rule described in last week's article. Grasping the pole marked "S" with the right hand so that the fingers point with the current, we find that the fingers have to go under the pole, thus causing the thumb to point to the right, this being the direction of the lines of force. The same direction will hold true at the "N" pole, so that the lines of force are caused to flow from the "N" to the "S" pole. This checks with the polarity we have assumed and shows that the coils are wound in the proper way.

Tracing the current from the "1" brush to the "2" brush we find the direction in each coil is shown by arrows, so that at the right air gap under the "S" pole the current is going in to the paper and at the left hand air gap the current is coming out. We will now use the left hand motor rule shown in Fig. 2. With the fore finger pointing from "N" to "S" and the center finger pointing toward the paper, the thumb points downward, indicating the armature will turn right hand or clockwise. In similar manner checking the left hand side of the armature the fore finger will point from "N" to "S" as before, but the center finger will now point up from the paper, causing the thumb to point up, again checking for right hand rotation.

In considering the path of the lines of force, we know that they will go from the "N" pole to the "S" pole by the easiest route, which is, of course, through as much iron as possible. They, therefore, go across the air to the iron ring, then through both the upper and lower halves of the ring to the other side and across the other gap to the "S" pole. As the path through the iron is an easy one for the magnetism, practically no lines of force go straight across the air gap in the center of the ring, and consequently the inner side of the turns of wire do not act in any way either to produce or reduce the torque available.

To check the direction of rotation of the armature, it is possible to use another thing that we know about magnetism,

for we can consider the effect that the turns on the right side have as far as magnetizing the armature is concerned, and we find that they tend to produce a "N" pole at the top of the ring, and if the left side turns are checked, it is found that they also contribute to the same result. From the magnetic laws that like poles repel and unlike attract, we again find that the armature tries to turn in a right hand direction. As the armature begins to rotate, the commutator segments slide along under the brushes, changing the connections continually, and maintaining the current directions and the magnetic conditions that are shown in the sketch, so that continuous rotation results.

The ring type of armature is used in the U. S. L. starting and lighting system, but most systems use the drum type of armature, shown in Fig. 4. This type of armature is made up of laminations or punchings of thin sheet iron of the general shape shown in Fig. 6 and Fig. 7, a stack of these being assembled on the shaft to form that part of the armature known as the core. When the core is assembled on the shaft it forms a series of slots in which the winding is placed, and the ends of the different coils in the winding go out to the commutator, also shown in Fig. 4, this being an assembly of pieces of copper, all insulated from each other, and from the shaft.

In Fig. 5 are shown types of field frames for which a drum armature might be adopted, assuming it were properly wound. For the two pole frames, we know that the wires of the winding that would lay under the "N" pole would have current going one way, and in order to have the wires under the "S" pole also help turn the same way, their current would have to go in the reverse direction, so that the armature for the two pole frame has current going one way on one side and the other way on the other side.

In order to make the armature work in the four pole frame, the current would have to reverse in each quarter of the armature, and in an armature for six pole frame, there would be three sections of the winding where the current went in one direction, and three other places,

(Concluded on page 53.)

The Automotive Repair Shop

Practical Maintenance Hints

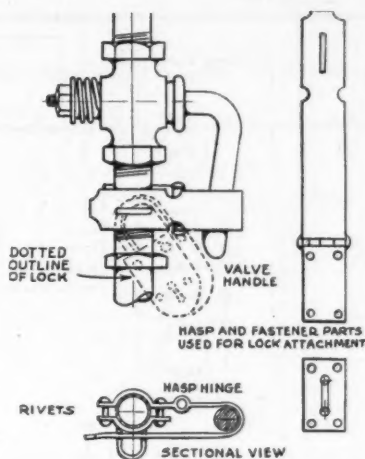
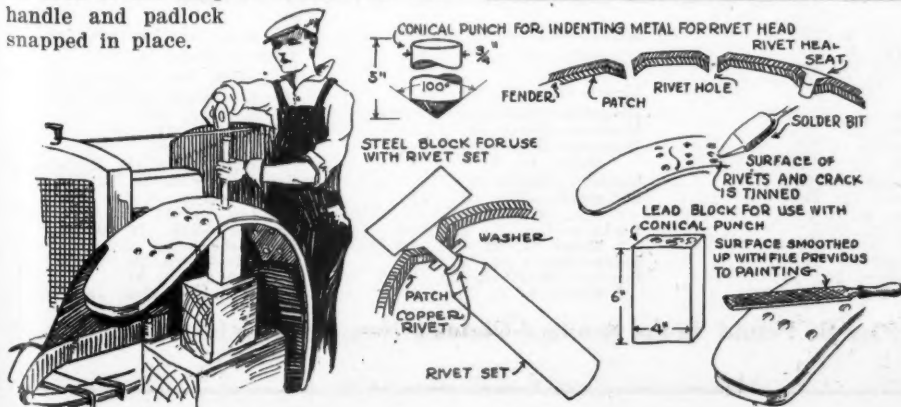
Patching Breaks in Fenders and Bodies

Where a patch is placed on the underside of a broken fender or on the side of a body to mend a break in the metal, the usual practice is to leave a conspicuous row of rivets outlining the patch secured to the under surface. To avoid the evidence of patching from the surface the positions for the rivets should be indented by means of a conical punch as shown in the sketch, after the rivet holes are drilled jointly through the metal and the patch. Using copper rivets and a rivet set, the head is held by means of a flat steel block set flush with the metal. The head of the rivet is then tinned with a soldering bit, flowing the metal evenly about the rivet head and the crack is also closed up with a film of solder if at all open. Having completed this, a file is used to flush up the surface. Painting over this patched job conceals it effectively. The extra work required to complete this job, in comparison with prevailing methods, is small when results are compared.

Fitting a Lock to a Gasoline or Oil Pipe Valve

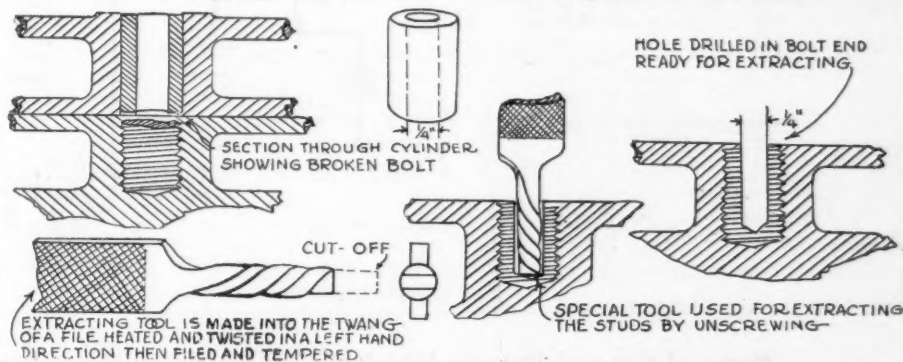
A simple method for attaching a hinged hasp to an oil valve or turn off cock is shown in the sketch and serves its purpose by adding a padlock when it is desired to prevent tampering with the valve by unauthorized persons. The use of this method of locking a valve is not restricted to oil pipes and is equally as serviceable for air, water, gasoline, etc.

The part of the hasp with the "U" fastener is riveted jointly over the pipe with the screw end of the hasp. A bend is made in the hinged part of the hasp to clasp over the handle of the valve. When not locked the hasp is thrown back leaving the valve free to be opened. To lock it the hasp is closed over the handle and padlock snapped in place.



Washer Improves the Funnel

The tipping over of the funnel while filling the gasoline tank or pouring oil into engine bases through breather pipes results with loss of oil unless the funnel is held with one hand, in which instance the person pouring is under a handicap. A simple modification to the funnel consists in soldering a large washer over the spout as is indicated in the sketch. With the washer secured to the funnel it will rest upright on the gas tank opening or on the breather pipes permitting the use of both hands for tipping the oil can.



Removal of Broken Cylinder Head Bolts

One of the occasional troubles which the repairman encounters is a broken cylinder head bolt. These broken segments are usually tightly imbedded in the cylinder block. The best method of removal is to drill out the part without running the drill into the thread and then remove the shell of the drilled out portion.

This permits of using the same size bolt and does not require retapping for a special size of bolt with the additional drilling of the cylinder head. To drill the bolt out it is advisable to use the head as a jig and slip a small bushing into the bolt hole, then drilling through this bushing. This avoids the drill running offside and cutting into the thread. After a hole about $\frac{1}{4}$ in. in size is drilled into the hole a specially twisted twang of a file is used to extract the shell of the thread.

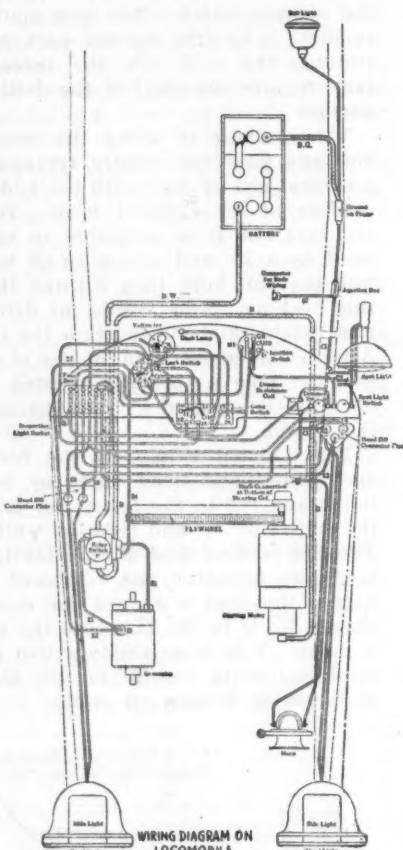
This twisted twang on the file is a special lefthand twist made by heating the twang red in the forge and gripping the end in a vise and twisting while hot. The end is then filed down slightly over $\frac{1}{4}$ in. in diameter and tempered. The harder this tool is turned the deeper it imbeds itself in the hole and the tighter it grips. This is as handy a tool as the mechanic could require for the purpose of removing broken off studs.

Above—Removing broken cylinder head bolt
Below—Washer to steady funnel

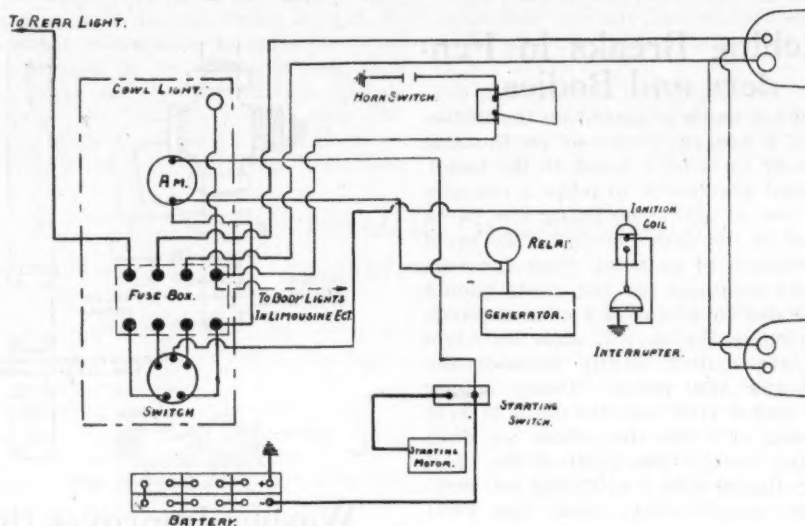


Motor Age Weekly Wiring Chart No. 126

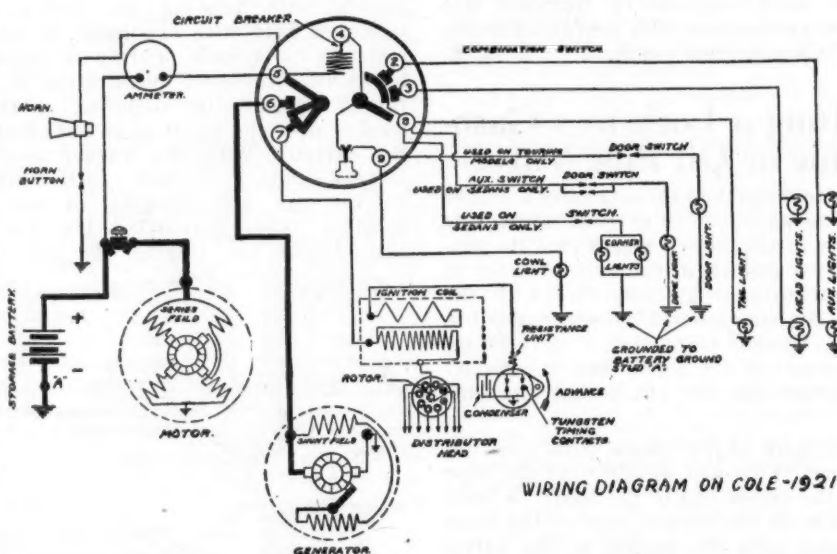
1921 Locomobile Westinghouse System



1921 Stearns-Knight—Westinghouse System



1921 Cole—Delco System



Name of Car and Date on Which Wiring Diagrams Have Appeared in Previous Issues

Allen—Sept. 30, '20
American Beauty—Feb. 17, '21
Buick—Dec. 23, '20
Cadillac—Nov. 18, '20
Case—Oct. 7, '20; Feb. 17, '21
Chalmers—Feb. 24, '21
Cleveland—Feb. 24, '21
Cole—Dec. 9, '20
Jan. 6, '21; Jan. 20, '21
Daniels—Feb. 17, '21
Dorris—Dec. 9, '20;
Feb. 24, '21
Elcar—Oct. 28, '20
Dec. 2, '20
Elgin—Oct. 14, '20

Elkhart—March 3, '20
Franklin—Dec. 2, '20
Gardner—April 14, '21
Grant—Nov. 25, '20; March 31, '21
Hudson—Jan. 13, '21
March 17, '21
Hupmobile—Feb. 3, '21
April 14, '21
Jackson—March 17, '21
Jordan—March 10, '21
King—March 3, '21
Kissel—Oct. 21, '20
Apr. 28, '21
Klinekar—Apr. 14, '21
Lexington—Dec. 16, '20
McFarland—March 24, '21

Mercer—March 24, '21
Mitchell—Jan. 6, '21; Apr. 21, '21
Moore—Nov. 11, '20
Moline-Knight—Nov. 4, '20
Monitor—March 31, '21
National—Dec. 16, '20
March 10, '21
Oakland—March 24, '21
Oldsmobile—Apr. 21, '21;
Apr. 28, '21
Packard—Oct. 7, '20
March 31, '21
Paige—March 10, '21
Peerless—Nov. 18, '20
March 3, '21

Pierce-Arrow—April 21, '21
Premier—Feb. 10, '21
Reo—Feb. 10, '21
Roamer—Dec. 30, '20
Feb. 10, '21
Saxon—Oct. 21, '20
Dec. 30, '20
Scripps-Booth—Feb. 3, '21
Sheridan—Feb. 3, '21
Stearns—Nov. 4, '20
Jan. 13, '21
Stephens—Sept. 16, '20
Studebaker—Oct. 29, '20
Templar—April 28, '21
Velie—Jan. 20, '21
Willys-Knight—Oct. 14, '20

Additional Wiring Diagrams May Be Found in the Readers' Clearing House in This Issue

Passenger Car Serial Numbers

Motor Age Maintenance Data Sheet No. 148

One of a series of weekly pages of information valuable to service men and dealers—save this page

METZ

Year	Model	Cyls.	Price	Serial Numbers
1912	22	4	\$495	15806-18301
1913	22	4	495	18302-22949
1914	22	4	475	22950-28800
				(Also 300 cars numbered from 28801 to 29100 on which equipment determines model)
1915	22	4	495	29101-32200
				(All the above have double chain drive and 22 H.P. engine and are roadsters)
	25	4	600	33000-36380
1916	25	4	600	36381-40248
1917	25	4	545	40249-44552
1918	25	4	695	
1919	Master Six	6	1695	45015-47508
1920	Master Six	6	1895	47509 up
				Number on crankcase

MITCHELL

Year	Model	Cyls.	Price	Serial Numbers
1912	2-4 4-4 5-4 } 4			22000-30000
	2-6 5-6 7-6 } 6			
1913	2-4, 5-4	4		30001-31500
	2-6, 5-6	6		35000-36284
	7-6	6		39500-39668
1914	A-40	4		40501-41500
	A-50	6		44001-46000
	A-60	6		49001-49250
1915	B-35	4		50001-51800
	B-45	6		55001-56000
	B-48	8		57001-57100
				Number plate on heel board of front seat, on right engine guard, and on left front frame member
1916	B-48	8		58000-60000
	C-42	6		60001-64905
1917	C-42	6		65001-69956
1917	D-40	6		70000-85000
1918	C-42	6		90000-95000
1919	E-42	6		95501-96495
	E-40	6		97001-106400
1920	E-40	6		1 up
				Number plate on left front door post near floor board, and on left frame member just ahead of radiator

MOLINE

Year	Model	Cyls.	Price	Serial Numbers
1912	M	4	\$1700	2362-2785
1913	M-40	4	1950	2786-3999
			2500	
1914	MK-50	4	3250	4001-4999
			3800	
1915	MK-40	4	1375	6001-6250
1916	MK-40	4	1450	6250-7012
1917	G-50	4	1840	8000-8330
	C-40	4	1495	9000-10999
1918	G-50	4	2250	8331-8450
	L-40	4	2000	11000-11220
			2500	
1919	G-50	4	2250	8451-8999
	L-40	4	2000	
			2500	11221-11600

Name changed to R & V Knight in December, 1919

Name on dash plate and on front left side of engine

MONROE (Indianapolis)

Year	Model	Cyls.	Price	Serial Numbers
1919	S-9	4	\$1295	.....16609
1920	S-9	4	1295	16610 up

MONROE (Pontiac, Mich.)

Year	Model	Cyls.	Price	Serial Numbers
1915	2	4	\$495	501 up
1916	4	4	1095	8000 up
1917	3	4	565	4001 up
	6	4	1095	9151 up
1918	M-4	4	995	

MOON

Year	Model	Cyls.	Price	Serial Numbers
1912	30			5371-5470
	40			6022-7000
	48			7002-7119
1913	30			5472-5483
	39			8001-8365
	48			7121-7293
	6-50			31002-31081
1914	42			13001-14344
	4-38			14401-14453
	6-50			31082-41351
	6-40			61304-61530
1915	4-28			14451-14500
	6-30			70000-70242
	6-40			61531-61953
	6-50			41354-41891
1916	6-30			70245-70666
	6-42			70667-71087
	6-44			62053-62252
	6-66			62253-66564
1917	6-42			71088-71393
	6-45			71394-71819
	6-66			66565-66884
	6-36			36000-36225
1918	6-36			36226-36996
	6-66			66885-67043
1919	6-46 Victory			46001-47551
	6-66			67044-66078
1920	6-48	6		48001 up
	6-68	6		68101 up

Number plate on models without four doors on outside of body at door latch. On the four-door models, plates are on dash under hood or under front seat

MOORE

Year	Model	Cyls.	Price	Serial Numbers
1919	30	4	\$895	1600
		4	995	7000
		4	1095	8000
1920	30	4	1095	8150 up
				Number under hood on right side of body; engine number on right side engine.

NASH (Formerly Jeffery) No yearly models

Year	Model	Cyls.	Price	Serial Numbers
	681, 5-P Spt.	6		100101-100114
	681	6		100612-111600
				127851-131825
	682, 7-P Tr.	6		111601-113601
	683	6		121001-122500
	684, Sedan	6		100108-100611
				119851-121000
				144331 up
	685, Coupe	6		94501-95000
				119913-119928
				144806-145405
				131851, 133251, 133351 up
	687, 4-P Rd			

Number on left front cross member, just back of radiator.

NATIONAL

Year	Model	Cyls.	Price	Serial Numbers
1912	MCC	4	\$2900	5501-7000
1913	M3C	4	3300	7001-8100
	V-3	4	3400	8101-9000
1914	6-W	6	2375	9001-10100
1915	AA	6	2375	10101-11100
1915-16	AB	6	2500	11101-14000
1916	AC	6	1690	14001-16000
	AD	12	1990	16001-17000
1917	AE	6	1750	17003-18000
	AH	12	2150	18001-20000
	AF-1	6	1995	20001-24000
	AF-2	6	2150	24001-25000
	AK-1	12	2595	25001-25550
1918	AK-2	12	2750	25551-27000
	AF-3	6	2150	27001-28000
1919	AL	6	2450	28001-28979
	AM	12	3050	32000-32148
1920	BB	6	3290	60000 up

Serial numbers on cars up to 1913 inclusive will be found riveted to the rear cross member of the frame. All cars after 1913 have the serial number on the left side of the frame, either under the front or rear fender.

Specifications of Current Passenger Car Models

NAME AND MODEL	Engine Make	Cylinders: Bore and Stroke	WB	Tires	2-Pass.	5-Pass.	7-Pass.	Coupe	Sedan	NAME AND MODEL	Engine Make	Cylinders: Bore and Stroke	WB	Tires	2-Pass.	5-Pass.	7-Pass.	Coupe	Sedan
Ace.....G	Guy	6-3 1/2 x 5	123	32 x 4	\$2975	\$2975	\$3680	\$3680	Maibohm.....B	Own	6-3 1/2 x 4 1/2	116	32 x 4	\$1575	\$1575	\$2395	\$2395
Ace.....H	H-S	6-3 1/2 x 5	123	32 x 4	2975	2975	.....	3680	3680	Marmont.....34	Own	6-3 1/2 x 5 1/2	136	32 x 4 1/2	5300	5000	6150	6600
Ace.....L	H-S	6-3 1/2 x 5	116	32 x 4	2260	2260	.....	.....	.....	Maxwell.....25	Own	4-3 1/2 x 4 1/2	109	30 x 3 1/2	995	995	1595	1695
Allen.....Series 43	Own	4-3 1/2 x 5	110	32 x 4	\$1395	1395	.....	2395	.....	McFarlan.....1921	Own	6-4 1/2 x 6	140	33 x 5	6300	6300	7500	7500
Ambassador.....R	Cont.	12-2 1/2 x 5	136	32 x 4 1/2	.....	4500	4500	6500	.....	Mercer.....Series 5	Own	4-3 1/2 x 6 1/2	132	32 x 4 1/2	4500	4500	5700	6200
Amco.....1921	H-S	4-3 1/2 x 5	114	31 x 4	.....	.....	.....	.....	.....	Merit.....Cont.	Own	6-3 1/2 x 4 1/2	119	32 x 4	2245	2245	.....	.....
American Six.....C	H-S	6-3 1/2 x 5	127	32 x 4	2395	2395	2475	3295	3495	Metz.....R & R	Dues	4-4 1/2 x 6	129	32 x 4 1/2	5500	5500	.....	.....
Anderson.....Series 40	Cont.	6-3 1/2 x 4 1/2	120	33 x 4	2195	1795	1845	2795	2795	Mitchell.....M6	Rut.	6-3 1/2 x 5	120	32 x 4	1995	1995	2795	2895	
Apperson.....8-21-S	Own	8-3 1/2 x 5	130	34 x 4 1/2	.....	3500	3500	4500	4500	Mitchell.....F-40	Own	6-3 1/2 x 5	120	33 x 4	1750	1750	2160	2900
Apperson.....Anniversary	Own	8-3 1/2 x 5	130	34 x 4 1/2	.....	4250	4250	.....	.....	Mitchell.....F-42	Own	6-3 1/2 x 5	127	33 x 4	.....	1995	.....	.....
Auburn.....6-39	Cont.	6-3 1/2 x 4 1/2	120	33 x 4	1745	1695	1695	2795	2795	Moller.....A	Own	4-2 1/2 x 4	100	27 x 3 1/2	2000	.....	.....	.....
Beggs.....20T	Cont.	6-3 1/2 x 4 1/2	120	33 x 4	1885	1885	.....	2785	2885	Monitor.....B50-52	Cont.	6-3 1/2 x 5	121	33 x 4	1850	.....	.....	.....
Bell.....4-32	H-S	4-3 1/2 x 5	114	31 x 4	.....	1495	.....	.....	.....	Monroe.....S-9 & 10	Own	4-3 1/2 x 4 1/2	115	32 x 3 1/2	1440	1440	.....	.....
Bell.....6-50	H-S	6-3 1/2 x 5	124	32 x 4	.....	1695	.....	.....	.....	Monroe.....S-11 & 12	Own	4-3 1/2 x 4 1/2	115	33 x 4	.....	2400	2500	
Biddle.....B-1	Buda	3-3 1/2 x 5 1/2	121	33 x 4	.....	.....	.....	.....	.....	Moore.....6-48	Cont.	6-3 1/2 x 4 1/2	122	32 x 4	2285	2185	2685	3185
Birch Super-Four.....H-S	4-3 1/2 x 5	117	33 x 4	.....	.....	.....	.....	.....	.....	Murray-Mac Six.....Own	6-3 1/2 x 5 1/2	128	34 x 4 1/2	4250	4250	4250	.....	
Birch Light Six.....H-S	6-3 1/2 x 5	117	33 x 4	.....	.....	.....	.....	.....	.....	Nash.....681-7	Own	6-3 1/2 x 5	121	33 x 4	1695	1695	1850	2895
Bour-Davis.....21S	Cont.	6-3 1/2 x 5 1/2	126	33 x 4 1/2	12585	1265	2585	.....	.....	Nash.....682	Own	6-3 1/2 x 5	127	34 x 4 1/2	.....	1875	.....	.....
Bradley.....Four	4-3 1/2 x 5	116	33 x 4	1265	.....	.....	.....	.....	.....	Nash Four.....41-4	Own	4-3 1/2 x 5	112	32 x 3 1/2	1395	1395	1985	2185
Brewster.....91	Own	4-4 1/2 x 5 1/2	125	32 x 4 1/2	17900	9000	.....	10500	.....	National Sixlet.....BB	Own	6-3 1/2 x 5 1/2	130	32 x 4 1/2	3750	3750	4900	4900
Briscoe.....4-34	Own	4-3 1/2 x 5	109	31 x 4	1285	1285	.....	1885	1885	Nelson.....D	Own	4-3 1/2 x 4 1/2	104	32 x 4	1900	.....	.....	.....
Brook.....S-21 A	Own	2-3 1/2 x 3 1/2	90	28 x 3	395	.....	.....	.....	.....	Noma.....1C	Cont.	0-3 1/2 x 4 1/2	128	32 x 4 1/2	3000	3200	4450	.....
Buick.....21-41-S-6-7	Own	6-3 1/2 x 4 1/2	118	33 x 4 1/2	1795	1795	.....	2585	2895	Northway.....Own	6-3 1/2 x 5 1/2	128	33 x 5	4200	4200	5600	5400	
Buick.....21-48-9-50	Own	6-3 1/2 x 4 1/2	124	24 x 4 1/2	.....	.....	2065	2985	3295	Norwalk.....430-KS	Lyc.	4-3 1/2 x 5	116	32 x 3 1/2	1285	.....	.....	.....
Bush.....E.C.4	Lyc.	4-3 1/2 x 5	.....	.....	1245	.....	.....	2050	2150	Oakland.....34-C	Own	6-2 1/2 x 4 1/2	115	32 x 4	1395	1395	2065	2065
Bush.....E.C.6	Lyc.	4-3 1/2 x 5	.....	.....	1575	.....	.....	4950	5190	Ogren.....6-60	Own	6-3 1/2 x 5 1/2	134	33 x 5	3850	3500	5000	5100
Cadillac.....59	Own	8-3 1/2 x 5 1/2	132	34 x 4 1/2	3790	3790	3940	.....	.....	Oldsmobile.....43-A	Own	4-3 1/2 x 5 1/2	115	32 x 4	1445	1445	2145	2145
Carroll.....6	Dues	6-3 1/2 x 5	128	.....	3985	3985	.....	.....	.....	Oldsmobile.....37A	Own	6-2 1/2 x 4 1/2	112	32 x 4	1450	1450	2145	2145
Carroll.....6	Dues	6-3 1/2 x 5	128	.....	3185	3185	.....	.....	.....	Oldsmobile.....46	Own	8-2 1/2 x 4 1/2	122	33 x 4 1/2	2100	2100	3300	3300
Case.....V	Cont.	6-3 1/2 x 5 1/2	126	34 x 4 1/2	12650	2650	3400	3750	.....	Oldsmobile.....47	Own	8-2 1/2 x 4 1/2	122	33 x 4	1995	1995	2395	2395
Chalmers.....6-30	Own	6-3 1/2 x 4 1/2	117	32 x 4	1795	1795	1945	2595	2745	Overland.....4	Own	4-3 1/2 x 4	100	30 x 3 1/2	895	895	1425	1475	
Chalmers.....6-30	Own	6-3 1/2 x 4 1/2	122	33 x 4 1/2	.....	1250	.....	.....	.....	Packard.....Single-Six	Own	6-3 1/2 x 4 1/2	116	33 x 4 1/2	2975	2975	4150	4250
Champion.....Tourist	Lyc.	4-3 1/2 x 5	113	32 x 3 1/2	.....	1595	1595	.....	.....	Packard.....Twin Six	Own	12-3 x 5	136	35 x 5	6000	6000	8200	8450
Champion.....Special	H-S	4-3 1/2 x 5	118	32 x 4	1595	1595	1930	2930	3030	Paige.....6-42	Own	6-3 1/2 x 5	119	32 x 4	1795	1795	2600	2720	
Chandler.....Six	Own	6-3 1/2 x 5	123	33 x 4	1930	1930	2010	2075	2075	Paige.....6-66	Cont.	6-3 1/2 x 5	131	33 x 4 1/2	2295	.....	2895	3775
Chevrolet.....490	Own	4-3 1/2 x 4	102	30 x 3 1/2	795	820	.....	1325	1375	Pan.....A	Own	4-3 1/2 x 5	108	33 x 4	1500	.....	.....	.....
Chevrolet.....FB	Own	110	33 x 4	1320	1345	.....	2075	2075	.....	Pan American E&F-6-55	H-S	6-3 1/2 x 5	121	33 x 4	2250	2250	.....	.....
Cleveland.....40	Own	6-3 1/2 x 4 1/2	112	32 x 4	1465	1465	.....	2375	2475	Parenti.....1921	Own	8-2 1/2 x 4 1/2	125	32 x 4	2000	1925	2895	3000
Climber Six.....S	H-S	6-3 1/2 x 5	125 1/2	32 x 4 1/2	2750	2750	3250	4250	4450	Paterson.....650	Cont.	6-3 1/2 x 4 1/2	120	33 x 4	1895	1895	2895	2895	
Cole.....870	Nort.	8-3 1/2 x 4 1/2	127	33 x 5	3250	3250	1995	2895	2895	Peerless.....56-S-7	Own	8-3 1/2 x 5	125	34 x 4 1/2	2290	2900	3680	3950	
Columbia.....D-C&S	Cont.	6-3 1/2 x 4 1/2	115	32 x 4	1945	1795	.....	2465	.....	Peters.....Own	2-3 1/2 x 3 1/2	90	28 x 3	385	.....	.....	.....
Comet.....C-53	Cont.	6-3 1/2 x 5 1/2	125	33 x 4 1/2	.....	2350	2450	3650	.....	Piedmont.....4-30	Lyc.	4-3 1/2 x 5	122	32 x 4 1/2	1795	.....	.....	.....
Commonwealth.....44	H-S	4-3 1/2 x 5	117	32 x 4	.....	1595	.....	4500	.....	Piedmont.....6-40	Own	6-3 1/2 x 4 1/2	122	32 x 4	1795	.....	.....	.....
Crawford.....21-6-40	Cont.	6-3 1/2 x 5 1/2	122 1/2	32 x 4	3000	3000	.....	.....	.....	Pierce-Arrow.....6-4	Own	6-4 1/2 x 5 1/2	138	35 x 5	8000	17500	7500	8500
Crow-Elkhart.....163-65	Lyc.	4-3 1/2 x 5	117	32 x 3 1/2	1295	1295	.....	.....	.....	Pilot.....6-50	H-S	6-3 1/2 x 5	126	32 x 4 1/2	2285	2285	3600	3600
Crow-Elkhart.....S63-65	H-S	6-3 1/2 x 5	117	33 x 4	1545	1545	.....	2395	.....	Porter.....40	Own	4-4 1/2 x 5 1/2	142	35 x 5	4600	4600	5000	6100
Cunningham.....V-4	Own	8-3 1/2 x 5	132	35 x 5	.....	.....	.....	.....	.....	Premier.....6-D	Own	6-3 1/2 x 5 1/2	129 1/2	33 x 5	4000	4600	5000	6100
Daniels.....D-19	Own	8-3 1/2 x 5 1/2	132	34 x 4 1/2	15350	15350	5350	6250	6950	Premocar.....6-40 A	Falls	6-3 1/2 x 4 1/2	117	32 x 3 1/2	.....	1295	.....	.....
Davis.....51-57	Cont.	6-3 1/2 x 4 1/2	120	33 x 4	1995	1895	12150	2795	2795	Premocar.....4-80	Dues	4-4 1/2 x 6	117	32 x 4 1/2	.....	3865	.....	.....
Dispatch.....4-1 1/2	Own	4-3 1/2 x 5	120	34 x 4	1290	1350	1525	1575	.....	Raleigh.....A-6-60	H-S	6-3 1/2 x 5	122	32 x 4 1/2	2750	2750	3600	3700
Dixie Flyer.....H-S-70	H-S	4-3 1/2 x 5	112	32 x 4	1595	1595	.....	2570	2570	Ranger.....A-20	Own	4-3 1/2 x 5	116	32 x 4	.....	2150	2850	2950
Dodge Brothers.....Own	4-3 1/2 x 4 1/2	114	32 x 3 1/2	1235	1285	.....	1900	2150	.....	R & V Knight.....R	Own	4-3 1/2 x 5	116	32 x 4	.....	2150	2850	2950
Dorris.....6-80	Own	6-4 1/2 x 5	132	33 x 5	14785	4785	5800	6990	.....	R & V Knight.....J	Own	6-3 1/2 x 4 1/2	127	32 x 4 1/2	3350	3350	4000	4200
Dort.....17-A	D-Ly	4-3 1/2 x 5	108	31 x 4	1215	1215	1865	1995	.....	Ree.....T-6	Own	6-3 1/2 x 5	120	33 x 4	1850	1850	2700	2750
Dupont.....A	Own	4-3 1/2 x 5 1/2	124	32 x 4 1/2	3400	3400	.....	4900	.....	Rever.....C	Dues	6-3 1/2 x 5 1/2	132	32 x 4 1/2	4850	4650	6500	6500
Elcar.....7-R	Own	6-3 1/2 x 4 1/2	117	33 x 4	1795	1795	1795	2500	2600	Reamer.....6-54-E	Cont.	6-3 1/2 x 4 1/2	120	32 x 4	.....	.....	.....	.....
Elgin.....K-1	Falls	6-3 1/2 x 4 1/2	118	33 x 4	1895	1775	.....	2795	2795	Rock Falls.....14000	Cont.	6-3 1/2 x 5 1/2	136	35 x 5	.....	.....	.....	.....
Elk-Hart.....L	Lyc.	4-3 1/2 x 5	117	32 x 3 1/2	1295	1295	.....	2195	.....	Rolls-Royce.....Own	6-4 1/2 x 4 1/2	143 1/2	33 x 5	11,500	Chassis s Price	.....	.....
Elk-Hart.....S	H-S	6-3 1/2 x 5	117	33 x 4	1545	1545	.....	2395	.....	Saxon.....125	Own	4-3 1/2 x 5	112	32 x 4	.....	1675	2475	2475
Esser.....Own	4-3 1/2 x 5	108 1/2	32 x 4	1595	1595	.....	2100	2450	.....	Sayers Six.....DP	Cont.	6-3 1/2 x 4 1/2	118	33 x 4	2495	2195	3295	3295
Fergus.....S-5-21	Own	3 1/2 x 5	126	32 x 4 1/2	.....	Chassis s Price	8500	.....	.....	Scripps-Booth.....B-39-42	Nort.	6-2 1/2 x 4 1/2	115	32 x 4	1545	1545	2215	2295
Ferris.....Cont.	6-3 1/2 x 5 1/2	130	32 x 4 1/2	3350	.....	3350	4100	.....	.....	Seneca.....L & O	Leit	4-3 1/2 x 4 1/2	108	30 x 3 1/2	1185	1185	.....	.....
Ford.....T	Own	4-3 1/2 x 4	100	30 x 3 1/2	395	440	745	795	.....	Severin.....Six	Cont.	6-3 1/2 x 5 1/2	122	33 x 4	1485	1485	2100	2250
Franklin.....9-B	Own	4-3 1/2 x 4	115	32 x 4	2700	2800	2750	3850	.....	Severin.....Six	Cont.	6-3 1/2 x 5 1/2	122	33 x 5	2550	2550	3250	3370
Friend.....Four	Own	4-3 1/2 x 4 1/2	112	32 x 3 1/2	1285	1285	.....	1985	2085	Sheridan.....4	Nort.	4-3 1/2 x 5 1/2	116	33 x 4	1685	1685	2565	2765
Globe.....B-10																			

Specifications of Current Motor Truck Models

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive
				Front	Rear						Front	Rear						Front	Rear	
Acason, R	1	\$2260	3 1/2 x 5 1/4	36x3 1/2	36x5	W	Corbitt, A	3 1/2	\$4500	4 1/2 x 5 1/2	36x5	36x10	W	Gramm-Bern., 25	2 1/2	\$3575	4 1/2 x 5 1/2	36x4	36x4	W
Acason, RB	1 1/2	2485	3 1/2 x 5 1/4	36x3 1/2	36x6	W	Corbitt, AA	5	5500	4 1/2 x 6	36x6	40x6	W	Gramm-Bern., 35	3 1/2	4375	4 1/2 x 5 1/2	36x5	40x5 1/2	W
Acason, H	2 1/2	3295	4 1/2 x 5 1/4	36x4	36x4 1/2	W	Cyclone	1 1/2	2800	3 1/2 x 5	34x5 1/2	36x7	W	Gramm-Bern., 50	5	5275	4 1/2 x 6	36x6	40x6 1/2	W
Acason, L	3 1/2	4295	4 1/2 x 5 1/4	36x5	36x5 1/2	W	Dart, S	2 1/2	.....	3 1/2 x 5 1/2	34x5 1/2	34x6	W	G.W.W.	1 1/2	2100	3 1/2 x 5 1/2	35x5	35x5	I
Acason, M	5	5250	5 x 5 1/4	36x6	40x12	W	Dart, M	2 1/2	.....	3 1/2 x 5 1/2	36x4	36x7	W	Hahn, J4	1	.....	3 1/2 x 5	34x5	34x5	W
Ace, C	1 1/2	2750	3 1/2 x 5 1/4	34x3 1/2	34x5	W	Day, W	1 1/2	2225	3 1/2 x 5	36x5	36x10	W	Hahn, CD	1 1/2	.....	4 1/2 x 5 1/4	36x3 1/2	36x6	W
Ace, A	3	3450	4 1/2 x 5 1/4	36x4	36x7	W	Day-Elder, A	1 1/2	2425	3 1/2 x 5	34x3 1/2	34x4	W	Hahn, EE	2 1/2	.....	4 1/2 x 5 1/4	36x4	36x8	W
Ace	3	3650	4 1/2 x 5 1/4	36x6	36x8	W	Day-Elder, B	1 1/2	2900	3 1/2 x 5 1/4	34x3 1/2	34x5	W	Hahn, F	3 1/2	.....	4 1/2 x 5 1/4	36x5	36x10	W
Acme, B	1	2175	3 1/2 x 5	34x3 1/2	34x5	W	Day-Elder, C	2 1/2	3125	4 1/2 x 5	36x4	36x7	W	Hahn, EF	5	.....	4 1/2 x 6	36x6	40x12	W
Acme, F	1 1/2	2475	3 1/2 x 5	34x3 1/2	34x5	W	Day-Elder, D	2 1/2	3950	4 1/2 x 5 1/2	36x5	36x5 1/2	W	Hal Fur, E	1	2350	4 x 5	35x5 1/2	35x5 1/2	W
Acme, A	2	3050	4 1/2 x 5 1/4	36x4	36x7	W	Day-Elder, E	5	4875	4 1/2 x 6	36x5	36x6 1/2	W	Hal Fur, F	2 1/2	3250	4 1/2 x 5 1/2	35x5	38x7	W
Acme, C	3 1/2	4050	4 1/2 x 5 1/4	36x5	40x10	W	Day-Elder, F	1 1/2	2180	3 1/2 x 5	36x4	36x5	W	Hal Fur, F	3 1/2	4250	4 1/2 x 5 1/2	36x6 1/2	40x10 1/2	W
Acme, E	5	5150	4 1/2 x 6	36x6	40x12	W	Dearborn, F	2	2590	3 1/2 x 5 1/2	35x5 1/2	36x7 1/2	W	Hall	1 1/2	3100	3 1/2 x 5	34x5 1/2	38x7 1/2	W
Acme, G	3 1/2	1790	3 1/2 x 5	35x5 1/2	35x5 1/2	W	Dearborn, 48	2	2590	3 1/2 x 5 1/2	35x5 1/2	36x7 1/2	W	Hall	2 1/2	3275	4 1/2 x 5 1/2	36x4	36x6	W
Akr'nMulti-Trk20	1	2485	4 x 5 1/4	34x5	34x5	B	Defiance, D	1 1/2	2550	3 1/2 x 5	35x5 1/2	36x7 1/2	I	Hall	3 1/2	4100	4 1/2 x 5 1/2	36x5	36x5 1/2	W
All-Power, C	3 1/2	5800	4 1/2 x 6	36x7	36x10	W	Defiance, E	2 1/2	2750	4 1/2 x 5 1/2	35x5 1/2	38x7 1/2	I	Hall	5	5100	4 1/2 x 5 1/2	36x5	40x6 1/2	W
All-American, B-1	1	1795	3 1/2 x 5	32x4	32x4	I	DeKalb, E2	2	2250	3 1/2 x 5 1/2	34x3 1/2	36x5	W	Hall	7	5100	4 1/2 x 5 1/2	36x5	40x6 1/2	C
All-American C-1	1 1/2	2195	3 1/2 x 5	34x4	34x5	I	DeKalb, E2 1/2	2	2600	4 1/2 x 5 1/2	36x4	36x7	W	Harvey, WEA	1 1/2	2550	4 1/2 x 5 1/2	34x3 1/2	34x5	W
American, 25	2 1/2	3575	4 x 6	36x4	36x4 1/2	W	DeMartini 1 1/2	1 1/2	2600	3 1/2 x 5	34x3 1/2	34x6	W	Harvey, WFA	2 1/2	3300	4 1/2 x 5 1/2	36x4	36x7	W
American, 40	4	4575	4 1/2 x 6	36x5	36x5 1/2	W	DeMartini 2	2	3300	4 x 5 1/2	36x3 1/2	36x7	W	Harvey, WHA	3 1/2	4300	4 1/2 x 6	36x5	36x5 1/2	W
Apex, G	1	1675	3 1/2 x 5	33x5 1/2	33x5 1/2	I	DeMartini 3	3	4250	4 1/2 x 5 1/2	36x4	36x10	W	Harvey, WKA	5	5200	4 1/2 x 6	36x6	40x6 1/2	W
Apex, D	1 1/2	1915	3 1/2 x 5 1/4	34x3 1/2	34x4	I	DeMartini 4	4	4800	4 1/2 x 5 1/2	36x5	36x12	W	Hawkeye, K	1 1/2	2365	3 1/2 x 5 1/4	34x3 1/2	34x5	I
Apex, E	2 1/2	2605	4 1/2 x 5 1/4	36x4	36x7	I	Denby, 33	1 1/2	2300	3 1/2 x 5	35x5 1/2	38x7 1/2	I	Hawkeye, M	2	2915	4 1/2 x 5 1/4	36x4	36x6	I
Apex, F	3 1/2	3975	4 1/2 x 6	36x5	36x10	I	Denby, 134	2	2800	3 1/2 x 5	36x3 1/2	36x6	I	Hawkeye, N	3 1/2	4345	4 1/2 x 6	36x5	36x10	I
Armleder, HW	2 1/2	.....	4 1/2 x 5 1/4	36x4	36x7	W	Denby, 25	3	3600	4 1/2 x 5 1/2	36x4	36x7	I	Hendrickson, K	5	4800	.....	.....	.....	W
Armleder, KW	3 1/2	.....	4 1/2 x 6	36x5	36x5 1/2	W	Denby, 27	4	4600	4 1/2 x 5 1/2	36x5	36x5 1/2	I	Hendrickson, M	2 1/2	3150	4 1/2 x 5 1/4	36x4	36x7	W
Armleder, 20	1	.....	3 1/2 x 5 1/4	34x3 1/2	34x5	W	Denby, 210	5	5350	4 1/2 x 5 1/2	36x6	40x6 1/2	I	Hendrickson, N	3 1/2	3975	4 1/2 x 5 1/2	36x5	36x5 1/2	W
Atco, B	1 1/2	.....	3 1/2 x 5 1/4	34x5 1/2	36x8	I	Dependable, A	3 1/2	1650	3 1/2 x 5	34x5	36x6	W	Highway, A410	4	.....	4 x 6	36x5	36x6 1/2	W
Atco, B1	1 1/2	.....	3 1/2 x 5 1/4	34x5 1/2	36x8 1/2	I	Dependable, C	1 1/2	2350	3 1/2 x 5 1/2	34x5 1/2	34x5	W	Highway, B510	5	.....	4 x 6	36x5	40x6 1/2	W
Atco, A	2 1/2	.....	4 1/2 x 5 1/4	36x4	36x8	W	Dependable, D	2	2650	4 x 5 1/2	34x5	36x6	W	Higraide, A17	3 1/2	1850	3 1/2 x 5	32x4 1/2	32x4 1/2	W
Atlas, M.D	1	.....	3 1/2 x 5	32x4 1/2	32x4 1/2	W	Dependable, E	2 1/2	2950	4 1/2 x 5 1/2	36x4	36x7	W	Higraide, A18	1	2100	3 1/2 x 5	35x5 1/2	35x5 1/2	W
Atterbury, 20R	1 1/2	2775	3 1/2 x 5	34x3 1/2	34x5	W	Dependable, G	3 1/2	3350	4 1/2 x 5 1/2	36x4	36x7	W	Higraide, B20	1 1/2	2500	4 1/2 x 5 1/2	35x4	36x6 1/2	W
Atterbury, 7CX	2 1/2	3375	4 1/2 x 5 1/4	36x4	36x4 1/2	W	Diamond T, O	1	2500	3 1/2 x 5 1/2	34x5 1/2	36x7	W	Huffman, B	1 1/2	1995	3 1/2 x 5	34x3 1/2	34x6	W
Atterbury, 7D	3 1/2	4175	4 1/2 x 5 1/4	36x5	40x5 1/2	W	Diamond T, FS	1 1/2	2990	3 1/2 x 5 1/2	36x3 1/2	36x5	W	Huffman, C	1 1/2	1795	3 1/2 x 5 1/2	34x3 1/2	34x6	I
Atterbury, 8E	5	5575	4 1/2 x 6	36x5	40x6 1/2	W	Diamond-T, T	1 1/2	2850	3 1/2 x 5 1/2	36x3 1/2	36x5	W	Hurlburt	1 1/2	.....	4 x 5 1/2	34x4	34x5	W
Autocar, 21UF	1 1/2-2	2300	4 1/2 x 5 1/4	34x4	34x5	D	Diamond-T, U	2	3285	4 x 5 1/2	36x4	36x7	W	Hurlburt	2 1/2	.....	4 1/2 x 5 1/2	36x4	36x4 1/2	W
Autocar, 21UG	1 1/2-2	2400	4 1/2 x 5 1/4	34x4	34x5	D	Diamond-T, K	3 1/2	4675	4 1/2 x 5 1/2	36x5	36x5 1/2	W	Hurlburt	3 1/2	.....	4 1/2 x 6	36x5	36x5 1/2	W
Autocar, 26V	.....	4350	4 1/2 x 5 1/2	34x5	36x10	D	Diamond-T, EL	5	5400	4 1/2 x 5 1/2	36x6	40x6 1/2	W	Hurlburt	5	.....	4 1/2 x 6	36x5	40x6 1/2	W
Autocar, 26-E	.....	4500	4 1/2 x 5 1/2	34x5	36x10	D	Diamond-T, S	5	5650	4 1/2 x 6	36x6	40x6 1/2	W	Huron Erie	1 1/2	2425	3 1/2 x 5	36x3 1/2	36x5	I
Available, H1 1/2	1 1/2	2750	4 x 5 1/2	36x3 1/2	36x5	W	Diehl, A	1	.....	3 1/2 x 5	34x4 1/2	35x5	I	Huron Mich.	2 1/2	2950	4 1/2 x 5 1/2	36x4	36x7	W
Available, H2 1/2	2 1/2	3475	4 x 5 1/2	36x4	36x8	W	Diehl, B	1 1/2	.....	3 1/2 x 5	36x6	36x6	I	Indep't (Iowa), G	1 1/2	2040	3 1/2 x 5 1/4	34x3 1/2	34x5	I
Available, H3 1/2	3 1/2	4475	4 1/2 x 5 1/2	36x5	40x5 1/2	W	Dispatch, F	1	1350	3 1/2 x 5	34x4 1/2	34x4 1/2	I	Indep't (Iowa), H.1	2 1/2	2940	4 1/2 x 5 1/4	34x4	34x6	I
Available, H5	5	5375	4 1/2 x 6	36x6	40x12	W	Doane	2 1/2	4100	4 1/2 x 5 1/2	36x5	36x7	C	Indep't (Iowa), B	1	1665	3 1/2 x 5	34x3 1/2	34x4	W
Available, H7	7	6000	5 x 6	36x6	40x14	B	Doane	6	6000	4 1/2 x 6 1/2	36x6	40x6 1/2	C	Indep't (Ohio), F	1 1/2	2585	3 1/2 x 5	36x3 1/2	36x5	W
Avery	1	.....	3 x 4	34x5 1/2	34x5 1/2	I	Dodge Brothers	1	1085	3 1/2 x 5	34x4 1/2	33x4 1/2	B	Indep't (Ohio), H	2 1/2	3285	4 1/2 x 5 1/2	36x4	36x4 1/2	W
Beck, A. Jr.	1	1800	3 1/2 x 5	34x3 1/2	34x4	I	Dorris, K-4	2	3400	4 1/2 x 5 1/2	36x4	36x7	W	Indep't (Ohio), K	3 1/2	4285	4 1/2 x 5 1/2	36x5	36x5 1/2	W
Beck, C	2	2550	4 1/2 x 5 1/4</																	

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive
				Front	Rear						Front	Rear						Front	Rear	
Larrabee, K	2½	\$3400	4½x5½	36x4	36x7	W	Patriot, Washg'n	2½	\$3450	4½x5½	36x4*	36x7*	W	Texas, TK39	1½	\$1550	3½x5	36x6	38x7	W
Larrabee, L	3½	4200	4½x5½	36x5	36x5d	W	Piedmont, 4-30	1½	1685	3½x5	34x4†	34x4†	W	Tiffin, F15	1½	2695	4½x5½	36x3½	36x5	W
Larrabee, W	5	5100	4½x6	36x6	40x6d	W	Pierce-Arrow	2	3750	4 x 5½	36x4	36x4d	W	Tiffin, F25	2½	3580	4½x5½	36x4	36x3½d	W
L.M.C., 2-20	2½	2540	4½x5½	36x4	36x4d	I	Pierce-Arrow	3½	4950	4½x6½	36x5	36x5d	W	Tiffin, F35	3½	4760	4½x5½	36x5	40x6d	W
Lien, L	2	2350	3½x5½	35x5½	35x5½	W	Pierce-Arrow	5	5700	4½x6½	36x5	40x6d	W	Tiffin, F50	5	5850	4½x6	36x6	40x6d	W
Lone Star, 9	1½	1545	3½x5	32x3½	32x4†	I	Pioneer, 50	1	1650	3½x4½	32x4½†	32x4½†	W	Tiffin, F60	6	6050	4½x6	36x6	40x12	W
Laeddinghaus, K	2-2½	3150	4½x5½	36x4*	36x7*	W	Pittsburgher, B	2½	3500	4½x5½	36x5*	36x7*	W	Titan, HT	3½	4550	4½x6	34x4*	40x5d	I
Laeddinghaus, C	1	2100	3½x5	35x5½	35x5½	W	Pony	1½	1400	3½x4	28x3½	28x3½	C	Titan, HD	6	5400	4½x6	36x5	40x6d	I
Laeddinghaus, W	1½	2700	3½x5½	34x3½	34x5*	W	Power, F	1½	1400	3½x5½	36x6	36x6	I	Titan, TS	2½	3400	4½x5½	34x4*	36x4d	I
Maccar, L	1½	2925	4½x5½	36x4	36x6	W	Power, C	1½	1400	4½x5½	36x5	40x10	W	Tower, J	1½	3000	4½x5½	35x5	38x7	W
Maccar, H	2½	3650	4½x5½	36x4	36x4d	W	Premocar, B-143	1½	2475	3½x5	36x5†	36x5†	W	Tower, H	1½	3475	4½x5½	36x4	36x7	W
Maccar, M-2	3½	4500	4½x6	36x5	36x5d	W	Rainier, R-11	1½	2150	3½x5	35x5½	35x5½	W	Tower, G	3½	4400	4½x5½	36x5	36x5d	W
Maccar, G	5	5500	4½x6	36x5	40x6d	W	Rainier, R-15	3½	4500	4½x5½	36x5	36x5d	W	Traffic, C	2	1595	3½x5	34x3½	34x5*	W
MacDonald, A	7½	5750	4½x6	40x7	40x14	I	Rainier, R-19	1	2350	3½x5	34x3½	31x4	W	Transport, 20	1	1850	3½x5½	34x3½	34x4	I
Mack, AB D.R.	1½	3450	4 x 5	36x4	36x3½d	D	Rainier, R-16	1½	2600	3½x5	34x3½	34x5	W	Transport, 30	1½	2250	3½x5	36x3½	36x5	I
Mack, AB Chain	1	3000	4 x 5	36x4	36x3½d	C	Rainier, R-18	2	2950	4½x5½	34x4	34x6	W	Transport, 50	2½	2785	4½x5½	36x4	36x7	I
Mack, AB Chain	2	3300	4 x 5	36x4	36x4d	C	Rainier, R-20	2½	3600	4½x5½	34x4	34x7	W	Transport, 70	3½	4195	4½x6	36x5	36x10	I
Mack, AB D.R.	2	3750	4 x 5	36x4	36x4d	C	Rainier, R17	5	5250	4½x5½	36x6	36x6d	W	Traylor, B	1½	2500	3½x5½	34x3½	34x5	W
Mack, AC Chain	3½	4950	5 x 6	36x5	40x5d	C	Ranger, TK-20-2	2	1100	3½x5	36x5†	36x5†	W	Traylor, C	2	3000	4 x 5½	36x4	36x7	W
Mack, AC Chain	5	5500	5 x 6	36x6	40x6d	C	Reo, F	3½-1½	1385	4½x4½	34x4½†	34x4½†	B	Traylor, D	3	3500	4½x5½	36x4	36x8	W
Mack, AC Chain	6½	5750	5 x 6	36x6	40x12	C	Reliance, 10A	1½	2500	4 x 5½	36x3½	36x5	I	Traylor, E	4	4700	4½x6	35x5	40x10	W
Mack, AC Chain	7½	6000	5 x 6	36x7	40x7d	C	Reliance, 20B	2½	3200	4½x5½	36x4	36x4d	I	Traylor, F	5	5100	4½x6	36x6	40x6d	W
Mack Trac, AB	5	3400	4 x 5	36x4	36x4d	C	Republic, 10	1	1695	3½x5	35x5½	35x5½	I	Triangle, AA	3½-1	1600	3½x5½	34x3½	34x5	I
Mack Trac, AC	7	4950	5 x 6	36x5	40x5d	C	Republic, 10exp.†	1	2095	3½x5	35x5½	35x5½	I	Triangle, A	1½	2350	3½x5½	34x3½	34x6	I
Mack Trac, AC	10	5500	5 x 6	36x6	40x6d	C	Republic, 11X	1½	2295	3½x5	34x3½	34x5	I	Triangle, C	2	2700	3½x5½	36x4	36x6	I
Mack Trac, AC	13	5750	5 x 6	36x6	40x12	C	Republic, 19	2½	2795	4½x5½	36x4	36x7	I	Triangle, B	2½	2950	4 x 5½	36x4	36x7	I
Mack Trac, AC	15	6000	5 x 6	36x7	40x7d	C	Republic, 20	3½	3845	4½x5½	36x5	36x10	I	Triumph, HB	2	2900	3½x5½	36x4	36x7	W
Mapleleaf, AA*	2	4150	4 x 5½	34x4	36x6	W	Riker, B	3	1100	4½x6	36x5	36x5d	W	Triumph, HC	1½	2550	3½x5½	36x3½	36x5	W
Mapleleaf, BB*	3	4775	4½x5½	36x4	36x4d	W	Riker, BB	4	1100	4½x6	36x5	36x6d	W	Triumph, G	1	1995	3½x5½	34x5½	34x5½	W
Mapleleaf, CC*	4	5770	4½x5½	36x5	36x5d	W	Rowe, CW	1½	3000	3½x5	36x5†	36x5†	W	Twin City, B.W.	2	3000	4 x 5½	36x4	36x7	I
Mapleleaf, DD*	5	6825	4½x5½	36x6	40x6d	W	Rowe, HW	4	4500	4½x6	36x5	36x6d	W	Twin City, A.W.	3	4400	4½x6	36x5	40x5d	W
Master, JW	1½	2600	4½x5½	34x3½	34x5	W	Rowe, C.D.W.	2	3300	4 x 5	34x4	36x3½d	W	Twin City, FWDB	3½	4750	5½x6	36x6	36x6	I
Master, W	2½	3290	4½x5½	34x4	36x7	W	Rowe, G.S.W.	3	4150	4 x 6	34x5	36x5d	W	Twin City, FWDA	5	5250	5½x6	36x7	36x7	I
Master, D	2½	3540	4½x5½	34x4	36x7	D	Rowe, G.P.W.	3	5250	3½x5½	38x7†	42x9†	W	Ultimate, A	2	3200	4 x 5½	36x3½	36x5*	W
Master, A	3	4190	4½x6	36x5	40x5d	D	Rowe, F.W.	5	5500	4½x6	36x6	40x6d	W	Ultimate, AJ	2	3250	4½x5½	35x5½	38x7	W
Master, E	3½	4640	4½x6	36x5	40x5d	D	Rumely, A	1½	2720	3½x5½	36x3½	36x5	W	Ultimate, B	3	3750	4½x5½	36x4	36x4d	W
Master, B	5	5290	4½x6	36x6	40x6d	D	Samson, KO 15	3½	865	3½x5	32x4	32x4	B	Ultimate, BL	3	3950	4 x 6	36x5	36x8*	D
Master, F	5	5440	4½x6	36x5	40x6d	D	Samson, E 25	1½	1395	3½x5	35x5	35x5	B	Union, F W	2½	4485	4½x6	36x5	36x8*	I
Master Trac, T	6	3740	4½x5½	34x4	36x4d	I	Sandow, G	1	2295	3½x5	34x3½	34x5	W	Union, H W	4	4485	4½x6	36x6	40x12	D
Maxwell, 1½	1½	1332	3½x5½	32x3	32x4	W	Sandow, CG	1½	2590	3½x5	34x4	34x6	W	Union, J W	6	5800	5 x 6	36x6	40x14	D
Menominee, HT	1	2080	3½x5	34x3½	36x5	W	Sandow, J	2½	3275	4½x5½	36x4	36x7	W	United, A	1½	2445	3½x5½	36x3½	34x5*	I
Menominee, H	1½	2725	4 x 5	36x3½	36x5	W	Sandow, M	3½	4295	4½x5½	36x5	36x5d	W	United, B	2½	3150	4½x5½	36x4	36x7*	I
Menominee, D	2	3245	4 x 6	36x4	36x4d	W	Sandow, L	5	4975	4½x5½	36x6	40x6d	W	United, C	3½	3975	4½x5½	36x5	36x5d	W
Menominee, G	3½	4270	4½x6	36x5	36x5d	W	Sanford, 25	2½	3350	4½x5½	36x4	36x4d	W	United, V	5	5100	4½x6	36x6	40x6d	I
Menominee, JJ	5	5450	4½x6	36x6	40x6d	W	Sanford, 35	3½	4200	4½x5½	36x5	36x5d	W	U.S., N	1½	2475	3½x5	36x3½	36x5*	I
Moline, 10	1½	2450	3½x5	34x5½	36x5½	I	Sanford, 50	5	5100	4½x6	36x5	40x6d	W	U.S., R	3	3795	4 x 5½	36x4	36x4d	W
Moreland, 20N	1½	2850	3½x5	35x5½	36x5½	I	Schacht, 2-Ton	2½	3550	4½x5½	36x4	36x7	W	U.S., S	4	4595	4½x6	36x5	36x5d	W
Moreland, 21B	1½	3125	4½x5½	36x3½	36x6	W	Schacht, 2½-Ton	2½	3850	4½x5½	36x4	36x4d	W	U.S., T	6	5850	4½x6	36x6	40x6d	W
Moreland, 21C	1½	3900	4½x5½	36x4	36x8	W	Schacht, 3-Ton	3½	4350	4½x6	36x5	36x5d	W	Vellie, 46	1½	2200	3½x5	36x3½	36x5	I
Moreland, 21H	3	4975	4½x6	36x5	40x5d	W	Schacht, 5-Ton	5	5350	4½x6	36x5	40x6d	W	Veteran*	1-1½	3500	3½x5½	36x5	36x5d	W
Moreland, 21J	5	5350	4½x6	36x6	40x6d	W	Schwartz, A	1	1585	3½x5	33x4½	33x4½	B	Veteran*	2-2½	4000	4½x5½	36x4	36x7*	W
Mutual, 2B	2½	3450	4 x 6	36x4	36x8	W	Schwartz, BW	1½	2600	3½x5½	34x3½	34x7	W	Veteran*	2½-3	4400	4½x5½	36x4	36x7*	W
Mutual, 2BP	2½	4150	4 x 6	38x7†	42x9†	W	Schwartz, C.W.S.	2	3200	4½x5½	36x4	36x5	W	Veteran	3½-4	5600	4½x6	36x5	36x5d	W
Napoleon, 7	1½	1350	3½x5	35x5																

Farm Tractor Specifications and Prices

TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Plow Capacity	TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Plow Capacity	TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Plow Capacity
All-In One	12-25	\$1975	3	Weid.	4-3 1/2 x 5 1/2	GDK	2-3	G-O.....G	14-28	\$1485	4	Wauk.	4-4 1/2 x 5 1/2	GorK	3	Post.....D	12-20	\$1800	4	Wauk	4-4 1/2 x 5 1/2	GorK	2
Allis-Chalm. B	6-12	925	2	LeR.	4-3 1/2 x 4 1/2	Gas.	1	Grain Belt. A	18-36	2150	4	Wauk.	4-4 1/2 x 6 3/4	GorK	4	Prairie Dog. L	9-18	650	3	Wauk	4-3 1/2 x 5 1/2	Gas.	2
Allis-Chalm. G.P.	6-12	850	2	LeR.	4-3 1/2 x 4 1/2	Gas.	1-2	Gray.....1920	18-36	1836	3	Wauk.	4-4 1/2 x 6 3/4	Gas.	4	Prairie Dog. D	15-30	1250	4	Wauk	4-4 1/2 x 6 3/4	Gas.	3
Allis-Chalm. 18-30	12-20	1495	2	Mid.W	4-4 1/2 x 5 1/2	Gas.	2-3	Ground Hog	19-31	2000	4	Erd.	4-4 x 6	GorK	3	Ranger Cal.	8-16	816	4	LeR.	4-3 1/2 x 4 1/2	Gas.	1
Allis-Chalm. 18-30	12-20	2150	4	Own	4-4 1/2 x 5 1/2	GorK	3-4	Gt. Western St	20-30	1950	4	Beav.	4-4 1/2 x 6	K.	4	Reed.....T-20	15-30	2250	4	Dom	4-4 1/2 x 6	K.	3-4
Allis-Chalm. 10-18	875	4	Own	4-4 1/2 x 5 1/2	G.K.	4		Hart-Parr 20	20	1195	4	Own	2-5 1/2 x 6 1/2	K.D	3	Reed.....A-1	18-36	2400	4	Dom	4-5 x 6	Gas.	4
Allwork.....2-G	14-28	4	Own	4-5 x 6	GorK	3		Heider.....D	9-16	4	Wauk	4-4 1/2 x 5 1/2	G.K	2	Reliable.....	10-20	985	4	Own	2-6 x 7	Ker.	2	
Allwork.....C	14-28	4	Own	4-5 x 6	GorK	3		Heider.....C	12-20	4	Wauk	4-4 1/2 x 5 1/2	G.K	3	Res.....	12-25	1600	4	Wauk	4-4 1/2 x 5 1/2	GorK	3	
Andrews Kin.D	18-36	2500	4	Own	1-4 1/2 x 5	Gas.	4	Heider.....Cult	6-10	4	LeR.	4-3 1/2 x 4 1/2	Gas.	1	Russell.....	12-24	4	Own	4-4 1/2 x 5 1/2	GorK	2-3		
Appleton.....A	3-5	4	Own	4-4 1/2 x 5 1/2	Gas.	2-3		Hicks.....	20-30	4	Wauk	4-4 1/2 x 6	KorG	4	Russell.....	15-30	4	Own	4-5 x 6 1/2	GorK	3-4		
Appleton.....1921	3-5	550	4	Own	4-4 1/2 x 5 1/2	Gas.	1-10	Huber Light 4	12-25	1385	4	Wauk	4-4 1/2 x 6	Gas.	3	Russell.....	20-35	4	Own	4-5 1/2 x 7	GorK	4-5	
Aultman-T.	15-30	4	Own	4-5 1/2 x 8	G.K	6		Huber Super 4	15-30	1885	4	Midw.	4-4 1/2 x 6	Gas.	3	Samson.....M	2	995	4	Nov.	4-4 x 5 1/2	G.K	2
Aultman-T.	22-45	4	Own	4-7 x 9	G.K.D	8		Illinois Super	18-36	2500	4	Clim.	4-5 x 6 1/2	G.K	4	Sandusky.....J	10-20	1250	4	Own	4-4 1/2 x 5 1/2	G.K.D	2
Aultman-T.	30-60	4	Own	4-7 x 9	G.K.D	8		Imperial.....E	40-70	5000	4	Own	4-7 1/2 x 9	G.K.D	10	Sandusky.....E	15-35	1750	4	Own	4-5 x 6 1/2	G.K.D	4
Automot. B-3.	12-24	1785	4	Herc.	4-4 x 5 1/2	Gas.	2-3	Indiana.....F	5-10	4	LeR.	4-3 1/2 x 4 1/2	Gas.	1	Shawnee Com.	6-12	2	LeR.	4-3 1/2 x 4 1/2	Gas.	10		
Avery SR.Cul	5-10	4	Own	4-3 x 4	G.K	2		International.	8-16	1000	4	Own	4-4 1/2 x 5	G.K.D	2	Shelby.....C	10-20	4	Erd.	4-4 x 6	GorK	2-3	
Avery.....Cult-C	5-10	4	Own	4-3 x 4	G.K	2		J-T.....N	20-40	3485	*2		4-4 1/2 x 6	G.K	3-4	Shelby.....D	15-30	4	Beav.	4-4 1/2 x 6	G.K	3	
Avery.....B	5-10	4	Own	4-3 x 4	G.K	2		Klumb.....F	16-32	4	Clim.	4-5 x 6 1/2	G.K	3-4	Short Turn.	20-40	1500	3		4-4 1/2 x 6	G.K	3	
Avery.....C	5-10	4	Own	4-3 x 4	G.K	2		LaCrosse.....M	6-12	900	4	Own	2-4 x 6	G.K	1	Square 1.....A	18-35	2075	3	Clim.	4-5 x 6 1/2	G.K	3
Avery.....16	12-25	4	Own	2-6 1/2 x 6	G.K.D	2-3		LaCrosse.....G	12-24	1250	4	Own	2-6 x 7	GorK	3	Steady Pull	12-24	1485	4		4-4 x 5	Gas.	3
Avery.....12-25	4	Own	2-6 1/2 x 7	G.K.D	3-4			Lauson.....	12-25	1495	4	Midw.	4-4 1/2 x 5 1/2	Gas.	3	Stinson.....4E	18-36	1835	4	Beav.	4-4 1/2 x 6	G.K	4
Avery.....14-28	4	Own	2-6 1/2 x 7	G.K.D	3-4			Lauson.....21	15-30	1985	4	Beav.	4-4 1/2 x 6	GorK	3-4	Stone.....	20-40	4	Beav.	4-4 1/2 x 6	G.K	4	
Avery.....18-36	4	Own	4-5 1/2 x 6	G.K.D	4-5			Leader.....B	12-18	1095	4	Own	2-6 x 6 1/2	G.K.D	2-3	Tiga.....3	15-27	2625	4	Wise.	4-4 1/2 x 6	Gas.	4-4
Avery.....25-50	4	Own	4-6 1/2 x 7	G.K.D	5-6			Leader.....N	16-32	1985	4	Clim.	4-5 x 6 1/2	G.K	3-4	Titan.....	10-20	1000	4	Own	2-6 1/2 x 8	G.K.D	3
Avery.....45-65	4	Own	4-7 1/2 x 8	G.K.D	8-10			Leader.....GU	18-35	2775	*4	Clim.	4-5 1/2 x 6	G.K	3-4	Tillerm.....A	2-6	385	4	Vur.	1-4 x 4	G.K	4
Bates.....	15-25	4	Own	4-4 1/2 x 6	Ker.	3		Leonard.....E	20-30	2530	4	Buda	4-4 1/2 x 6	G.K	3	Topp.....B	30-45	3500	4	Wauk	4-4 1/2 x 6 1/2	Gas.	3-4
Bates S.M.	15-22	4	Own	4-4 1/2 x 6	G.K.D	3		Liberty.....A	18-32	2475	4	Clim.	4-5 x 6 1/2	G.K	4	Tora Cultivator	6-10	3	LeR.	4-3 1/2 x 4 1/2	Gas.	2	
Bates Mule F	18-25	4	Midw	4-4 1/2 x 5 1/2	Gas.	3		Linn.....W	60	5600	*4	Wauk.	4-5 x 6 1/2	Gas.	6	Townsend	10-20	2	Own	4-6 1/2 x 7	Ker	2-3	
Bates Mule H	15-25	4	Midw	4-4 1/2 x 5 1/2	Gas.	3		Little Bear.....	4	850	4	Ford	4-3 1/2 x 4	Gas.	4	Townsend	15-30	2	Own	4-7 x 8	Ker	3-4	
Bates Mule G	25-35	4	Midw	4-4 1/2 x 6	Gas.	com.		Little Giant B.	16-22	2200	4	Own	4-4 1/2 x 5	K.	4	Townsend	25-50	2	Own	4-8 1/2 x 10	Ker	4-8	
Bean.....	8-16	4	Own	14-3 1/2 x 6	G.K	2-3		Little Giant A.	26-35	3300	4	Own	4-5 1/2 x 6	K.	4	Tractor Motor	40-50	4		8-3 1/2 x 5	Gas.	4-5	
Beeman.....G	2-4	340	4	Own	1-3 1/2 x 4 1/2	G.K.D	1	Lombard.....	85-150	4	*2		6-5 1/2 x 6 3/4	Gas.	16	Traylor.....TB	6-12	815	4	LeR.	4-3 1/2 x 4 1/2	Gas.	1
Best.....30	20-30	3250	*2	Own	4-4 1/2 x 6 1/2	G.K.D	1	Motor Macult.	1 1/2	225	2	Own	1-2 1/2 x 3 1/2	Gas.	3	Triumph.....H	18-36	2450	2	Erd.	4-4 1/2 x 6	Ker.	4
Best.....60	35-60	5750	*2	Own	4-6 1/2 x 8	G.K.D	8-9	Magnet.....B	14-25	1875	4	Wauk	4-4 1/2 x 5 1/2	K&G	3	Trundaar.....10	25-40	4250	*2	Wauk	4-4 1/2 x 6	GorK	4
Boring.....1921	1850	3	Wauk	4-4 1/2 x 5 1/2	GorK	2		Market.....	2-4 1/2	4	Vur.	1-4 x 4	Gas.	1	Turner.....1921	14-25	1295	4	Buda	4-4 1/2 x 6	G.K	3	
Burn-Oil 1921	15-30	1650	4	Own	2-6 1/2 x 7	Ker.	3-4	Master Jr.....	5-10	585	2	LeR.	-2 1/2 x 4	Gas.	1	Twin City.....	12-20	4	Own	4-4 1/2 x 6	G.K	3	
Capital.....	15-30	1000	2	Own	4-4 1/2 x 6	Gas.	33	Merry Gar1921	2	230	2	Evin	1-2 1/2 x 2 1/2	Gas.	1	Twin City.....	20-35	4	Own	4-4 1/2 x 6 1/2	G.K	5	
Case.....	10-18	1090	4	Own	4-3 1/2 x 5	GorK	2	Minne. All-P	12-25	1325	4	Own	4-3 1/2 x 7	GorK	3	Twin City.....	40-65	4	Own	4-7 1/2 x 9	G.K	8	
Case.....	15-27	1680	4	Own	4-4 1/2 x 6	GorK	3	Mohawk 1921	8-16	785	4	Light	4-3 1/2 x 4 1/2	KorG	1-2	Uncle Sam C20	12-20	1385	4	Wid	4-4 x 5 1/2	GorK	2-3
Case.....	22-40	3100	4	Own	4-5 1/2 x 6 1/2	GorK	4-5	Moline Univ D	9-18	1075	2	Own	4-3 1/2 x 5	Gas.	2-3	Uncle Sam B19	20-30	2300	4	Beav.	4-4 1/2 x 6	GorK	3-4
Caterpillar T11	25	4	Own	4-4 1/2 x 6	Gas.	4		Moline Orch.	9-18	1075	2	Own	4-3 1/2 x 5	Gas.	2-3	Uncle Sam D21	20-30	2075	4	Beav.	4-4 1/2 x 6	GorK	3-4
Caterpillar T16	40	4	Own	4-6 1/2 x 7	Gas.	6		Monarch B.....	30-20	2400	*2	Beav.	4-4 1/2 x 6	G or K	4	Universal.....	1-4	475	2	Own	1-3 1/2 x 5	G	1
Centaur.....	5-2 1/2	495	2	NWay	2-4 1/2 x 4 1/2	GorK	1-9	Metox.....	15-30	3250	4	Buda	4-4 1/2 x 6	Gas.	3-4	Utilitor.....501	2 1/2-4	380	4	Own	1-3 1/2 x 4 1/2	G	5-6
Chase.....	12-25	4	Own	4-4 1/2 x 5 1/2	GorK	2-3		NB.....1	3-6	425	4	Own	2-3 1/2 x 4	Gas.	3 1/2	Valie. Biltwell	12-24	1750	4	Own	4-4 1/2 x 5 1/2	G.K.D	3
Chicago.....40	40	2500	4	Own	4-4 1/2 x 6	Gas.	4	NB.....2	3-6	425	4	Own	2-2 1/2 x 4	Gas.	3 1/2	Victory.....1921	9-18	1350	4	Gray.	4-3 1/2 x 5	Gas.	2
Cletrac.....W	12-22	1485	*2	Own	4-4 x 5 1/2	G.K.D	2-3	Nichols-Shep.	20-42	3100	Own	8	x10	GorK	3-6	Victory.....1921	15-30	1750	4	Wauk	4-4 1/2 x 5 1/2	Gas.	3
Dakota.....4	15-27	1750	3	Dom.	4-4 1/2 x 6	Gas.	3	Nichols-Shep.	20-42	3100	Own	8	x10	GorK	3-6	Vim.....B	15-30	1650	4	Wauk	4-4 1/2 x 5 1/2	G.K	3
Dart.....B.J.	15-30	4	Own	4-4 1/2 x 6	Gas.	3-4		Nichols-Shep.	20-42	3100	Own	8	x10	GorK	3-6	Wallis.....K	15-25	1600	4	Own	4-4 1/2 x 5 1/2	G.K	3
Depue.....A	20-30	2500	4	Buda	4-4 1/2 x 6	Gas.	4	Nichols-Shep.	20-42	3100	Own	8	x10	GorK	3-6	Waterloo.....N	12-25	4	Own	2-6 1/2 x 7	G.K	3	
Dill.....D	20	2480	4	Cont.	4-4 1/2 x 5 1/2	Gas.	3	Nichols-Shep.	20-42	3100	Own	8	x10	GorK	3-6	Webfoot.....40	25-40	4000	4		4-4 1/2 x 6	G.K	3
Do-It-All.....	4-6	595	4	Own	1-4 1/2 x 5	Gas.	5-6	Nichols-Shep.	20-42	3100	Own	8	x10	GorK	3-6	Webfoot.....53	28-53	5250	*2	Wise.	4-5 1/2 x 7	G.D	6
Eagle.....F	12-22	1390	4	Own	2-7 x 8	GorK	3-4	Nichols-Shep.	20-42	3100	Own	8	x10	GorK	3-6	Wellington B	12-22	1600	4	Erd.	4-4 x 6	Ker.	2-3
Eagle.....F	16-30	1850	4	Own	2-8 x 8	GorK	4-5	Nichols-Shep.	20-42	3100	Own	8	x10	GorK	3-6	Wellington F	16-30	2100	4	Chief	4-4 1/2 x 6	Ker.	3-4
E-B.....AA	12-20	4	Own	4-4 1/2 x 5	GorK	3		Nichols-Shep.	20-42	3100	Own	8	x10	GorK	3-6	Western 1920	16-32	2100	4	Clim.	4-5 1/2 x 6	Gas.	4
E-B.....Q	12-20	4	Own	4-4 1/2 x 5	GorK	3		Nichols-Shep.	20-42	3100	Own	8	x10	GorK	3-6	Wetmore.....	12-25	1650	4	Wauk	4-4 x 6 1/2	G.K	3
E-B.....	16-32	4	Own	4-5 1/2 x 7	GorK	4		Nichols-Shep.	20-42	3100	Own	8	x10	GorK	3-6	Wharton.....E	12-20	1800	3	Gray	4-3 1/2 x 5	Gas.	2
Evans.....	18-30	2000	4	Buda	4-4 1/2 x 6	G.K	3	Nichols-Shep.	20-42	3100	Own	8	x10	GorK	3-6	Whitney.....	9-18	1175	4	Own	2-5 1/2 x 6 1/2	Gas.	3
Fageol.....D	9-12	1525	4	Lye.	4-3 1/2 x 5	Gas.	2	Nichols-Shep.	20-42	3100	Own	8	x10	GorK	3-6	Wichita.....T	15-30	2500	4	Beav.	4-4 1/2 x 6	G.K.D	3-4
Farm Horse.....	18-30	1885	4	Clim.	4-5 x 6 1/2	G.K	3-4	Nichols-Shep.	20-42	3100	Own	8	x10	GorK	3-6	Wisconsin.....E	16-30	4	Clim.	4-5 x 6 1/2	Ker.	4	
Farquhar.....																							

COMING MOTOR EVENTS

AUTOMOBILE SHOWS

Chicago	Used Automobile Show	May 7-15
Bangor, Me.	Automobile Show	May 9-14
Rocky Mount, N. C.	Annual Automobile Show	May 10-14
Cincinnati	Fall Automobile Show	Oct. 1-8

RACES

Indianapolis Speedway	500 Mile Race	May 30
Uniontown Speedway	Speedway Events	June 18
Cincinnati	Speedway Race (Possible)	July 4
Tacoma	Speedway Race	July 4
Le Mans	French Grand Prix	July 25
Elgin	Road Race (Possible)	August 3
Pikes Peak	Hill Climb	September 5
Uniontown Speedway	Annual Autumn Classic	September 5
Los Angeles	Speedway Race	November 24

FOREIGN SHOWS

Prague	Czecho-Slovak International Exposition	May 28, 1921
Basle, Switzerland	International Automobile Exhibition	May 28, June 8
Reykjavik, Iceland	Agricultural Machinery	June, 1921
Buenos Aires, Argentina	Passenger Cars and Equipment	September
Luxemburg	Luxemburg Agricultural Sample Exhibition	September
Paris, France	Paris Motor Show	Oct. 5-16
London	British Motor Show, Society Motor Mfrs. and Traders	Nov. 4-12

CONVENTIONS

Cleveland	National Foreign Trade Council	May 4-7
Newark, N. J.	New Jersey Automotive Trade Association	May 12
Buffalo	Convention of Factory Service Managers, Auspices of Service Committee, N. A. C. C.	May 17-19
West Baden, Ind.	Summer Meeting Society of Automotive Engineers	May 24-28
Mackinac Island, Mich.	Summer Meeting Automotive Equipment Association	June 20-25
Chicago	Twenty-eighth Annual Convention National Implement & Vehicle Association	Oct. 12-14

Business Notes

The Auto Gear & Parts Co. has been organized in Philadelphia by H. Plummer and George Henderson to carry parts for virtually all makes of cars and to sell them both to dealers and direct to consumers.

The Diamond-Holfast Rubber Co., manufacturer of automobile tire patches and other patented rubber products, has purchased an eleven acre site in suburban Atlanta and will construct a modern factory, to include salesrooms and general offices, on the site at once.

Christian Girl, president of the C. G. Spring Co., Kalamazoo, announces that former stockholders of the old Kalamazoo Spring & Axle Co. have subscribed for \$120,000 of the 8 per cent preferred stock and 1,200 shares of common stock of the C. G. Spring Co. The stock is to be issued to them in a period extending over some 18 months. The newly acquired automobile bumper industry is now being moved to Kalamazoo and will be installed in the local plant. The head bumper sales office will also be located here. Service stations will be maintained at Chicago, Detroit and Cleveland. It is the intention to extend the bumper service to other important points.

The Elgin Motor Car Corp. made optimistic reports of its business at the annual stockholders meeting at the plant at Argo, Ill. C. S. Rieman, president and general manager, reported that while the plant had not been operating at full capacity during the winter business depression it had not closed down and the output is now being increased. The stockholders authorized a bond issue for new buildings and increased working capital, the amount to be determined by the board of directors. All the old board was re-elected with the exception of J. M. Snitzler whose place was taken by the election of Frank H. Shaw of the Fort Dearborn National bank, Chicago.

The Lockwood Mfg. Co., Kansas City, Mo., making automobile tops, seat, tire and radiator covers, has filed a voluntary petition in bankruptcy in the federal court at Kansas City, showing about \$342,759 in unsecured obligations and \$269,207 assets, represented in stock and equipment in the Kansas City factory and warehouses and the Buffalo factory. The Lockwood & Lockwood Mfg. Co., Kansas City. Albert company has now no connection with the Baker

Newman of the National Bank of Commerce, who has been appointed receiver, will continue operation of the plants and it is expected that a sale will enable operation to proceed uninterrupted to retain advantage of the prestige in automobile accessories which the company had built.

The Ewing Bolt & Screw Co., one of the late additions to Detroit industries, has started operations in its plant at River Rouge. The company makes screws, bolts and rivets and business on the books is said to be sufficient to keep the plant in operation for 60 days. M. E. Ewing is president of the company.

The India Tire & Rubber Co., Akron, paid on April 1 a quarterly dividend of 1 1/4 per cent on its preferred stock and 2 per cent on its common stock.

The Black & Decker Mfg. Co. has moved its New York branch office to the Printing Crafts building, Eighth avenue and Thirty-third street, where it has established a service station with a factory trained mechanic in charge. A complete set of parts will be carried. G. R. Lundane is manager of the New York territory and is assisted by E. I. Firestone and R. T. Watts.

Supervision of the territories formerly covered for the Lubrite Refining Co., St. Louis, by the Ensign Oil Corp. of Chicago which up to recently had been its representative, is now handled direct by D. F. McConaughy of the home office of the Lubrite company.

The Doss Rubber & Tube Co., Atlanta, has been granted a license by the Georgia Securities Commission to sell \$100,000 of preferred stock, paying 8 per cent. The company manufactures tires and tubes, having a factory in Atlanta that has been in operation for some years.

The Laminated Shim Co., manufacturer of laminum for shims, will remove to its new plant and offices at Long Island City, N. Y. The building is of concrete and brick construction and the manufacturing space available totals 25,000 square feet.

The Maxwell Motor Sales Corp., a factory branch, in the future will retail Chalmers and Maxwell cars in the Portland, Ore., territory. The C. L. Boss Automobile Co. has had the distribution for the past three years. The Maxwell Motor Sales Corp. has been located in Portland for some time handling parts and supplies for the northwest territory, but hitherto had not handled the cars.

The Blekre Tire & Rubber Co., a new concern started in St. Paul, has designated Portland as its Pacific coast distribution point, and will open offices here soon, and a storage warehouse for tires a little later. Thomas R. King, formerly representative of one of the big Akron tire concerns in the Rocky mountain district, is western manager for the company and recently arrived in Portland to make arrangements for placing the Blekre tire on the Pacific coast market.

The Automotive Equipment Manufacturers' and Distributors' Association, an organization comprising nearly all the men of Portland who are engaged in this end of the automotive business, has begun publication of a roster of members. The roster will contain the names and addresses of all members and of all business houses affiliated with the organization, together with data as to the various automotive equipment lines handled by each firm.

Illinois and Iowa Haynes Dealers Stage Driveaway



Line-up of Haynes Fiftys at the country estate of Alton G. Seiberling, vice president and general manager of The Haynes Automobile Co., Kokomo, Ind., composing part of the big driveaway staged by Illinois and Iowa Haynes dealers Saturday. The drive-away was supervised by Triangle Motors, Inc., Haynes distributors at Chicago. The two men in the foreground are Mr. Seiberling and Mr. William Elliott Phelps, general sales manager of the Haynes company